









THE FIRST LINES  
OF THE  
PRACTICE OF SURGERY:

DESIGNED AS  
AN INTRODUCTION FOR STUDENTS, AND A CONCISE  
BOOK OF REFERENCE FOR PRACTITIONERS.

---

By SAMUEL COOPER,

SURGEON TO THE FORCES; MEMBER OF THE ROYAL COLLEGE OF SURGEONS, AND OF  
THE MEDICAL AND CHIRURGICAL SOCIETY OF LONDON; MEMBER OF THE  
MEDICAL SOCIETY OF MARSEILLES; HONORARY FELLOW OF THE  
ACADEMY OF NATURAL SCIENCES AT CATANIA, &c., &c.

---

WITH NOTES,

By ALEXANDER H. STEVENS, M.D.

PROFESSOR OF SURGERY IN THE UNIVERSITY OF NEW YORK; SURGEON OF THE NEW  
YORK HOSPITAL; CONSULTING PHYSICIAN OF THE NEW YORK DISPENSARY;  
MEMBER OF THE NEW YORK LITERARY AND PHILOSOPHICAL SOCI-  
ETY; OF THE ACADEMY OF NATURAL SCIENCES OF PHILA-  
DELPHIA; AND OF THE LINNEAN SOCIETY OF  
NEW ENGLAND.

---

AND ADDITIONAL NOTES,

By SAMUEL M'CLELLAN, M. D.

PROFESSOR OF ANATOMY IN JEFFERSON MEDICAL COLLEGE, &c.

---

FOURTH AMERICAN, FROM THE FIFTH LONDON EDITION,

REVISED AND CORRECTED.

LIBRARY  
SURGEON GENERAL'S OFFICE  
IN TWO VOLUMES—VOLUME II.

DEC. 1-1901

Philadelphia:

176857.

GRIGG & ELLIOT, 9 NORTH FOURTH STREET.

1835.



Annex  
W0  
100  
C778fi  
v.2  
1835

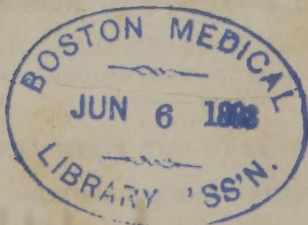
**EASTERN DISTRICT OF PENNSYLVANIA, TO WIT:**

(L. S.) BE IT REMEMBERED, That on the eighteenth day of September, in the fifty-fifth year of the Independence of the United States of America, A. D. 1830, JOHN GRIFF, of the said District, has deposited in this Office the Title of a Book, the right whereof he claims as proprietor, in the words following, *to wit*:

"The First Lines of the Practice of Surgery: designed as an introduction for students, and a concise book of reference for practitioners. By Samuel Cooper, surgeon to the forces; member of the Royal College of Surgeons, and of the Medical and Chirurgical Society of London; member of the Medical Society of Marseilles; honorary fellow of the Academy of Natural Sciences at Catania, &c., &c. With Notes, by Alexander H. Stevens, M. D., professor of surgery in the University of New York; surgeon of the New York Hospital; consulting physician of the New York Dispensary; member of the New York Literary and Philosophical Society; of the Academy of Natural Sciences of Philadelphia; and of the Linnean Society of New England. And additional notes, by Samuel McClellan, M. D., professor of anatomy in Jefferson Medical College, &c. Third American, from the fifth London edition, revised and corrected. In two volumes."

In conformity to the Act of the Congress of the United States, intituled, "An Act for the encouragement of learning, by securing the copies of maps, charts, and books, to the authors and proprietors of such copies, during the times therein mentioned." And also to the Act, entitled, "An Act supplementary to an Act, entitled, 'An Act for the encouragement of learning, by securing the copies of maps, charts, and books, to the authors and proprietors of such copies, during the times therein mentioned,' and extending the benefits thereof to the arts of designing, engraving, and etching historical and other prints."

D. CALDWELL, Clerk of the  
Eastern District of Pennsylvania.



Philadelphia:  
T. K. Collins & Co., Printers,  
No. 6 George Street.

# CONTENTS OF VOL. II.

## PART II.

	Page
CHAP. XXII. Diseases of the Tongue and Salivary Ducts	5
XXIII. Diseases of the Tonsils and Uvula . . .	14
XXIV. Amputation of the Lower Jaw-Bone . . .	16
XXV. Wounds of the Throat and Neck . . .	22
XXVI. Foreign Bodies in the Œsophagus . . .	29
XXVII. Laryngotomy and Bronchotomy . . .	31
XXVIII. Wry-neck . . . . .	34
XXIX. Bronchocele . . . . .	38
XXX. Wounds of the Chest . . . . .	41
XXXI. Paracentesis of the Chest . . . . .	54
XXXII. Removal of a Diseased Breast, and Tumours in general . . . . .	56
XXXIII. Wounds of the Belly . . . . .	59
XXXIV. Psoas Abscess . . . . .	78
XXXV. Paracentesis Abdominis . . . . .	81
XXXVI. Hernia . . . . .	82
XXXVII. Hydrocele . . . . .	145
XXXVIII. Hæmatocele . . . . .	170
XXXIX. Diseases of the Testicle . . . . .	172
XL. Castration . . . . .	181
XLI. Cirsocele and Varicocele . . . . .	193
XLII. Hernia Humoralis . . . . .	196
XLIII. Cancer Scroti . . . . .	201
XLIV. Gonorrhœa . . . . .	203
XLV. Gleet, Chordee, Sympathetic Buboës, &c. . . . .	211
XLVI. Phimosis . . . . .	213
XLVII. Paraphimosis . . . . .	228
XLVIII. Amputation of the Penis . . . . .	232
XLIX. Strictures of the Urethra . . . . .	241
L. Fistulæ in Perinæo . . . . .	264
LI. Retention of Urine . . . . .	268
LII. Puncturing the Bladder . . . . .	278
LIII. Incontinence of Urine . . . . .	285
LIV. Imperforate Vagina . . . . .	287



	Page
CHAP. LV. Imperforate Anus . . . . .	291
LVI. Fistula in Ano . . . . .	293
LVII. Polypi of the Uterus . . . . .	297
LVIII. Lithotomy . . . . .	303
LIX. Spina Bifida . . . . .	328
LX. Amputation . . . . .	332
LXI. Whitlow . . . . .	357
LXII. Venesection . . . . .	359
LXIII. Particular Fractures . . . . .	361
LXIV. Particular Dislocations . . . . .	400

---

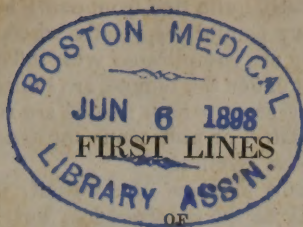
## APPENDIX.

Anchylosis . . . . .	452
Exsection of the Clavicle . . . . .	455
Extirpation of the Parotid Gland . . . . .	457

---

## DIRECTIONS RESPECTING THE PLATES.

PLATE VII.	to face page . . . . .	16
VIII.	. . . . .	20
IX.	. . . . .	302
X.	. . . . .	302
XI.	. . . . .	390



# THE PRACTICE OF SURGERY.

## CHAPTER XXII.

### DISEASES OF THE TONGUE, AND SALIVARY DUCTS UNDER IT.

#### RANULA

Is a tumour, arising from a distention of one of the salivary ducts under the tongue, in consequence of the existence of some obstruction to the ready escape of the saliva from its orifice.

The swelling is usually situated on one side of the frænum, and, when large, sometimes extends under the apex of the tongue. It consists of a sac, composed of the dilated duct, and filled with a clear fluid, purulent matter, or an earthy substance. Unless it be of long standing, its contents resemble the white-of-egg; but, in cases which have existed some time, they are of a thicker quality, and may even acquire a calcareous hardness. The size of a ranula varies considerably in different cases, from that of a pea to that of a hen's egg. In some instances, it becomes exceedingly large, pushing the tongue upward in such a degree, that deglutition and respiration are obstructed, while its lateral pressure thrusts out the teeth, and renders the lower jaw-bone carious. Some swellings of this kind have been known to contain a pint of matter.

The shape of ranulæ is subject to variety; some are round; others oblong;\* and elongations of the sac occasionally reach a considerable way backward under the tongue.

\* "On reconnoit, deux especes de grenouillettes; les unes rondes, placées sous la langue, semblent n'être produites que par la dilatation du  
VOL. II.—B

Ranulæ are frequently quite free from pain; but, in some instances, they are very painful, especially when the tongue is moved, or when they are complicated with inflammation.

Encysted tumours under the tongue, are sometimes mistaken for ranulæ. In many cases, where ranulæ are reported to have contained a caseous, fatty, or pultaceous substance, the diseases were probably encysted swellings.

When ranulæ attain the size of a walnut, they sometimes burst, and a cure may be the consequence; but, in general, the opening is not large enough; or the lodgment of calcareous matter in the sac, prevents the complete removal of the disease.

Some years ago, the plan of attempting to restore the perviousness of the obstructed duct, by the introduction of a small probe, was suggested by Desault; but the passage of the instrument is mostly difficult, and rarely answers, except in very recent cases.

The common practice is to open the tumour freely; press out its contents; and remove every particle of calcareous matter, that can be felt. With these proceedings, are sometimes joined the plan of cutting away the whole anterior portion of the sac with scissors, and even the attempt to destroy the rest of it with caustic.

Perhaps the excision of a portion of the sac is the surest mode of cure; for when the incision is too small, or closes prematurely, the disease generally recurs. It was in this manner, that my friend Mr. Lawrence treated, with perfect success, an enormous ranula, that formed a large prominent swelling, extending from the symphysis to the angle of the jaw.

When the substance of a tumour beneath the tongue is fat, the best plan is to take hold of the swelling with a hook, draw it forward, and carefully take it out, by detaching it from its lateral connexions with a bistoury; and breaking those on the side towards the raninal artery, with the fingers. If much bleeding occur, a dossil of lint should be pressed into the wound; but the use of a spirituous gargle will generally suffice.

Sometimes, when no swelling is evident, calcareous concretions form in the salivary ducts, and excite pain and uneasiness. In some instances, the calculus projects from the orifice of one of the ducts into the mouth, and admits of being drawn out with a pair of forceps. In others, it is necessary to make an incision, for its extraction.

canal excrétoire de la glande sublinguale; les autres sont plus longues que rondes, placées à la partie latérale de la langue, et formées par la dilatation du canal excrétoire de la glande maxillaire inférieure." See M. de la Faye's Notes on Dionis.

\* Richter's Anfangsgr. band. iv. p. 4. edit. 2.



## DIVISION OF THE FRÆNUM OF THE TONGUE.

A preternatural confinement of the apex of the tongue may arise from two causes, viz. the frænum may extend too far forward, or it may not be of sufficient length. The first malformation is the most common; both kinds impede the motion of the tongue, prevent children from sucking, and cause an impediment to speech. Hence, in persons born dumb, the state of the frænum should always be examined. As tongue-tied children are supposed by ignorant nurses to be frequently met with, and the operation for their relief is not exempt from danger, every surgeon should know, that, in infants, an incapacity to suck, in consequence of the evidently immovable state of the tongue, caused by the above defects, forms the only just ground for dividing the frænum.

Hence, before performing an operation, the surgeon should not be satisfied with merely hearing that a child cannot suck; as this incapacity may be owing to other causes, particularly the large size of the nurse's nipple, adhesions of the sides of the tongue to the inside of the mouth, &c. A nurse brought a child to me a few weeks ago, and told me it was tongue-tied and unable to suck. This I knew must be a mistake, as the infant was a fortnight old, and had at first sucked very well. On examination, the cause of the difficulty of sucking was found to depend upon an excoriated state of the lips. The practitioner ought to examine with his eyes, whether the frænum extends too far forwards; a thing most easily ascertained, as in the natural state, about a quarter of an inch of the under surface of the tongue, from the apex backward, remains quite unconnected with the frænum. When this part ties the tongue too closely to the bottom of the mouth, by reason of its shortness, the surgeon cannot raise the tongue towards the palate with his fingers.

The operation consists in dividing the frænum, as far as seems necessary; and it is so simple, as to require no particular explanation. The best instrument for performing it is a pair of sharp scissors with blunt points. No more of the frænum ought to be divided than is essential to the object in view; and pointed instruments should never be employed. The situation of the raninal arteries renders this caution of the highest importance; for many children have lost their lives from these vessels having been unskilfully wounded by careless or ignorant operators.

The frænum serves to confine the tongue, and keep it from being thrown too far backward in deglutition. If an unnecessary incision, or one that is too extensive, be made, the tongue may be carried beyond the narrow part of the throat, and so engaged

in the opening of the pharynx, as not to admit of being brought back again into its natural situation. The first opportunity which Petit had of observing this event, was in a child, that died about five hours after its frænum linguæ had been divided. Upon passing a finger into the child's mouth, he was surprised at not being able to feel the tongue, and at perceiving, that the posterior opening of the mouth was completely stopped up by a fleshy substance, which, upon an incision being made through the cheek, was found to be the tongue itself.

When Petit was sent for to another infant, which had fallen into a state approaching to suffocation, about two hours after its frænum linguæ had been cut, he immediately tried to ascertain the cause of the occurrence. When he introduced his finger into the child's mouth, he found that the tongue was half displaced backward. There was no difficulty in reducing it; but the accident recurred several times in the course of the day. Mechanical means were now deemed necessary to prevent the displacement. A thick compress was placed on the tongue, and retained with tape applied round the lower jaw. Whenever the infant had occasion to suck, the apparatus was taken off for a short time. The little patient was sent into the country, however, where the plan was neglected, and death from suffocation soon followed.

Petit met with other examples, in which children, in similar danger, were saved by perseverance in the method that he proposed.

The second dangerous consequence, occasionally resulting from the operation of dividing the frænum linguæ, is hemorrhage from one of the raninal arteries or veins. All writers on this operation have noticed the accident. Petit saw it take place when the large vessels of the tongue were uninjured, and of course the bleeding proceeded entirely from the small vessels distributed to the membrane of the frænum itself. The blood which escapes from them, and collects in the mouth, leads the infant to make continual endeavours to suck, by which means the bleeding is kept up, until extreme or even fatal weakness is induced. As the child continues to swallow the blood as fast as it oozes into the mouth, the bleeding may never be suspected, until all hopes of recovery are past. Dionis mentions a case, in which the stomach of an infant, who died a few hours after the operation, was found quite distended with blood. With regard to hemorrhage from the small vessels of the frænum, Petit met with several examples of it, where unavailing attempts were made to stop the bleeding with astringent applications, and badly contrived compresses. Hence, he was led to invent, for the stoppage of the hemorrhage, an apparatus, that is at once simple, ingenious, and effectual. The

surgeon is to get a piece of birch, and cut it through below the place where two branches of equal size unite. It is to be made to resemble a sort of fork, the prongs of which are to be about eight lines long, and the handle four. It is then to be covered all over with linen, and put under the tongue in such a way, that the end of the handle is to rest against the middle of the concavity of the arch of the jaw, while the prongs embrace the frænum, and compress the bleeding vessels. The middle of a roller is next to be applied to the dorsum of the tongue, as far back as possible, and the ends, after crossing each other under the chin, are to be pinned to the child's nightcap. In this manner the vessels are compressed, from below upward by the prongs of the wooden fork, while the bandage makes pressure from above downward. Thus the tongue is fixed, and the bleeding is effectually stopped. But, if the plan should not answer, the actual cautery ought to be applied without delay; and, in the event of its failure, the lingual artery, or carotid, should be tied. Hemorrhage from the raninal veins may arise from their varicose state, quite independently of a wound, and prove so obstinate as to require the cautery. Considerable bleeding, from the raninal vessels, has sometimes been suppressed by putting a piece of ice under the tongue.

#### WOUNDS OF THE TONGUE.

The most frequent wounds of the tongue are transverse. They are hardly ever produced by outward means; but usually by the teeth, when the lower jaw is forcibly and spasmodically brought against the upper one, while the tongue is out of the mouth, as sometimes happens in epilepsy, and falls upon the chin. In this way, deep transverse wounds may be produced, almost separating the apex from the body of the tongue. In such cases, the injury may easily be converted into a sort of cleft, which may remain forever afterwards, and more or less impede the functions of the organ.

Hence, some writers on surgery have recommended all deep wounds of the tongue to be immediately closed with a suture.

The application of a suture to the tongue being attended with some difficulty, Pibrac invented a very simple bandage for uniting transverse wounds of this organ.\* The main portion of it is a little sort of bag, in which the forepart of the tongue is confined. Thus all motions of this organ forwards, or laterally, may be effectually prevented, but the patient is not deprived of the power of drawing it backward, that very action,

\* Mém. de l'Acad. de Chirurg. tom. ix. p. 22. pl. 9.—Le Blanc, *Precis d'Operations*.



which has a direct tendency to make the sides of a transverse wound separate from each other.

Richter objects to Pibrac's bandage, that it is irksome to children, and decidedly unnecessary in all cases, because the motions of the tongue which it directly restrains, namely, those forwards, or to either side, may be hindered by applying a bandage to the jaw, and making the patient refrain from talking and mastication. The same author affirms, that such treatment has answered as well as could be desired, in numerous cases, some of which were large transverse wounds, in restless and unmanageable children. During the treatment, the patient should be allowed only liquid nourishment, which ought to be imbibed through a tube.

If the wound should be so deep as almost to separate the anterior part of the tongue from the rest of this organ, the remaining connexion is not to be divided, but an endeavour made to bring about an union with the aid of a suture.

#### DANGEROUS ENLARGEMENT OF THE TONGUE.

Sometimes, when this organ is inflamed, it swells so prodigiously, that it protrudes between the teeth, entirely fills up the cavity of the mouth, and obstructs speech, deglutition, and even respiration. Here, common antiphlogistic measures will not afford relief with sufficient quickness. The most effectual plan is to make two longitudinal cuts near the edges of the dorsum of the tongue, from one to two inches in length. The copious bleeding, which follows, soon brings about a diminution of the swelling, and the incisions readily heal.

Jourdain, by taking blood from one of the raninal veins, afforded his patient immediate relief.\*

In one example, the disease resisted every means, until a blister was applied to the throat.†

Some inflammations of the tongue have originated from the lodgment of foreign bodies in it, as a fish-bone, or a needle. Other cases have arisen from the injudicious employment of mercury, and the excitement of a sudden and immoderate salivation. Many examples are connected with violent inflammation of the parts about the throat.

Inflammation may induce mortification, and the loss of the greater part of the tongue. Here the treatment must conform to the general rules, delivered in the chapter on mortification.

When, in consequence of any enlargement of this organ, or other disease in the mouth, the necessary food and medicines

\* *Traité des Maladies de la Bouche, &c.*

† Richter's *Anfangsgr. der Wundarzn.* band. iv. p. 29.

are for a considerable time prevented from being taken, they may be injected into the stomach through an elastic catheter, which is to be passed through one of the nostrils down the œsophagus.

#### ULCERS, INDURATIONS, AND TUMOURS.

Ulcers on the tongue, of a painful, obstinate, and irritable nature, are sometimes produced by the sharp, or rough edge of a tooth. If the tooth be sound, the projection or roughness must be filed off; if it be carious, the best plan is to extract it. When these objects are accomplished, the sore usually heals without further trouble.

Some very obstinate ulcers of the tongue, connected with disorder of the digestive organs, may be cured by giving small doses of the blue pill every night, with occasional purgatives, and the compound decoction of sarsaparilla.

Ulcers, deserving the epithets *malignant* and *cancerous*, not unfrequently form on the tongue. Sometimes the disease in its incipient state appears as a sore. Sometimes a circumscribed, movable, or immovable, scirrhus swelling, is first observable, which gradually becomes painful, and ulcerates. In other instances, there is in the beginning only an induration in the substance of the tongue, without the smallest appearance of swelling. The ulcers under consideration are always surrounded by hardness. They may make their first appearance either at the edges, or at the apex, of the tongue. In certain cases, the whole, or a large portion of this organ, is covered with numerous small scirrhus tubercles, which gradually fall into a state of ulceration. I have seen them greatly diminished by a gentle course of mercury. All the medicines, tried in other cases of cancer, especially arsenic, conium, belladonna, hyosciamus, stramonium, &c. may here be exhibited, but, on the whole, the timely employment of the knife merits most confidence.

Some malignant sores on the tongue have been cured by repeatedly applying leeches to its under surface.\*

It would be inexcusable to pass over in silence such ill-conditioned ulcers of the tongue, as originate during violent salivations. Sometimes similar sores, produced by the same cause, take place at the same time on the tonsils, and, in this circumstance, inexperienced surgeons, or mistaken practitioners, are apt to suppose the ulcers to be of a venereal character. This error leads to the free use of mercury; the sores frequently slough, and the patient's health becoming greatly deranged, he is thrown into a state of imminent peril. Here, it is hardly necessary to observe, that the use of mercury must be immediate-

\* Medical Communications, vol. ii.

ly omitted, and the mouth frequently washed with a solution of alum.

For the removal of a cancerous portion of the tongue, a bistoury is the best instrument; and the patient's mouth should be kept open during the operation, by something interposed between the teeth. The hemorrhage is the circumstance most apprehended; but we have instances related of large portions, and even the anterior half of the tongue being amputated, and of the bleeding being easily suppressed, either by the actual cautery, or some of the above-named means for the suppression of hemorrhage.\* I think a tolerably dexterous man might tie the mouth of an artery in this situation, with the assistance of two pair of forceps to draw the ends of the ligature, when the noose has been put over the tenaculum, round the bleeding point. Certainly, cancerous diseases of the tongue may have advanced so far, that an operation cannot be prudently undertaken. The bleeding would be a serious objection; the whole distemper might not be removable; and the contaminated state of the glands, below the jaw, usually existing in this advanced stage, might render a perfect cure quite impracticable.

When the disease is not in the vicinity of the apex of the tongue, the operator may find it difficult to draw the part sufficiently forwards. In this circumstance, surgical authors recommend the employment of a pair of forceps for the purpose, the blades of which are to be covered with linen. Should this instrument be found ineffectual, they advise the surgeon to use a pair of forceps, the blades of which terminate in two short double hooks.

Here, as in all other cancerous cases, it is the duty of the surgeon to take care, that no part, suspected of participating in the disease, be left behind.

Abroad, surgeons have sometimes affected a cure by applying the cautery, notwithstanding the wound, after the operation, had put on an unhealthy and fungous appearance.† In this country, practitioners might hope for similar success from the cautious employment of caustic; for the revival of the cautery, under any circumstances, is an idea now almost intolerable to every British practitioner.

After the excision of a diseased portion of the tongue, local applications cannot be very well used, nor are they in general necessary, when the patient moves the part as little as possible, and avoids stimulating food.

Cancerous portions of the tongue may also be extirpated, by

\* See *Mém. Physiologique et Pathologique sur la Langue*, par M. Louis, in *Mém. de l'Acad. de Chirurgie*, tom. xiv. edit. 12mo.; also Ruysch's *Observ. Anat. Chir. obs. 76.*

† *Journ. de Médecine*, tom. xviii.



passing a double ligature through this organ, and firmly tying one part of the ligature over each side of it.

This plan must be infinitely more painful, than the removal of the diseased part with a knife. To the latter method, the hemorrhage is the only objection; and notwithstanding all that has been said, I think no surgeon ought to venture to cut away a diseased tongue, without having first made up his mind, respecting what method should be adopted for stopping the bleeding.\*

When much of the tongue has been lost, its functions may be rendered very imperfect. However, numerous cases are recorded, in which the greater part of this organ was lost, and yet the patients retained the faculties of tasting, masticating, swallowing, and articulating words, with considerable perfection.†

The removal of scirrhus and sarcomatous tumours of the tongue may be most conveniently accomplished with a scalpel and a tenaculum. Encysted swellings of this organ are generally of the meliceris kind, and ought, if possible, to be dissected out, without opening the cyst at all.‡

Authors relate examples in which the tongue was of extraordinary magnitude, either in consequence of original malformation, or disease. Excepting the deformity, some of the patients experienced no particular inconvenience, as they could speak, masticate, and swallow tolerably well.§ Under these circumstances, the removal of the redundant portion would not be advisable; but if the disfigurement were combined with much inconvenience, the operation ought to be performed.

\* {The bleeding might be in a great measure restrained by securing the lingual arteries, as they run parallel to the horn of the os hyoides, where they are comparatively superficial and easily reached, not covered by muscles, and only connected with the lingual nerve.}

† See *Mém. Physiologique, &c. sur la Langue* par M. Louis, in *Mém. de l'Acad. de Chirurgie*, tom. xiv. edit. 12mo.

‡ Schmucker describes the extirpation of a large encysted tumour of the tongue, the appearance of which had excited suspicions of the patient having two tongues. See *Vermischte Chir. Schriften*, band. iii. p. 322.

§ Sandifort's Obs.

## CHAPTER XXIII.

## DISEASES OF THE TONSILS AND UVULA.

WHEN the tonsils are inflamed, the swelling sometimes obstructs deglutition and respiration in so dangerous a degree, that prompt succour is urgently required. The most expeditious plan of relief is to scarify the tonsils freely, and promote the bleeding with warm gargles.

Venesection, leeches, calomel, saline purgatives, antimonials, and gargles, may also be of service.

Abscesses of the tonsils should be opened early, so as to prevent the grievances which would result from the continuance and increase of the swelling. Some neglected cases, in unhealthy, scrofulous individuals, have been known to spread to a considerable extent, and not to burst in the mouth, as is usual, but in the Eustachian tube, or even in the meatus auditorius externus, attended with caries of the mastoid process, deafness, and fistulæ.

The tonsils are subject to an indolent enlargement, improperly termed *scirrhus*; as a portion of them in this state may be cut off without the least danger of the rest assuming a malignant nature. When the swelling is considerable, it may seriously obstruct speech, deglutition, and respiration.

In general, astringent gargles prove ineffectual. The tumour, however, admits of being removed, but only so much of it should be taken away as the patient's relief makes necessary. The remaining portion then heals without the least difficulty; a clear proof that the disease is not of a cancerous nature.\*

Many good surgeons prefer tying diseased tonsils to cutting them away. The operation may sometimes be accomplished with a common eye-probe bent, and furnished with a ligature, which may be a piece of silver wire or catgut. Another plan is to introduce a double ligature through the nostril, until the noose appears in the throat. With a pair of forceps, the noose is now placed round the tumour. The ends of the ligature, having been brought through a double cannula, which is to be passed as far as the tonsil, are to be fastened to rings at the

\* Richter's Anfangsgr. de Wundarzn. band. iv. p. 46.

outer end of the instrument, which is next to be twisted, till the due constriction is produced.\*

Desault employed a *serre-nœud*, for putting the noose over the diseased tonsil, and producing the necessary constriction. It was nothing more than a little ring, mounted on a longitudinal narrow piece of steel, about five inches long, the other end of which was grooved, or rather forked. The diseased tonsil was first taken hold of with a double hook. With the ring, the noose was conducted along the hook, and put over the tonsil, the ligature was then drawn out, while the ring pressed the noose downward and backward. The requisite constriction was maintained by twisting the ends of the ligature round the forked extremity of the instrument, on the outside of the mouth.†

When the disease had a broad base, Cheselden recommended the use of an instrument like a crooked needle, set in a handle, with an eye near the point, threaded with a ligature, which was introduced through the bottom of the gland, and laid hold of with a hook. The needle was then withdrawn; the double ligature brought forwards; and one part tied above, the other below, the tumour, the ends being cut off near the knots. Although the treatment by ligature generally answers very well, cases sometimes occur, in which it is followed by such swelling of the tonsil and adjacent parts of the throat, that the patient is threatened with suffocation, and necessity obliges the surgeon to cut the ligature, and remove it.

The removal of the whole of an enlarged tonsil is unnecessary, and therefore injudicious; because a *portion* of the tumour may always be cut away without any risk of dangerous bleeding. Bertrandi, and other eminent surgeons, have cut away many enlarged tonsils, without ever meeting with an instance of danger from the bleeding.

For the excision of diseased tonsils, Desault sometimes employed a flat sheath, made of silver, and having a notch in it for the reception of the base of the tonsil. The latter part being thus taken hold of, a spring was touched, when a concealed blade immediately moved across the notch, and made the requisite division, without any risk of injuring other parts. However, the operation may be easily done with a pair of scissors, constructed with short blades and long handles; or with a hook and bistoury.‡ The use of a cold astringent gargle will soon stop the bleeding.

\* See NOTE A.

† *Cœuvres de Desault*, par Bichat, tom. ii. p. 233.

‡ { Great advantage is derived in operating with the scissors about the throat, by having teeth filed on one of the blades, in such a manner that their apices shall incline towards the handles; these will prevent the por-



Calculus concretions may be formed in the tonsils, and occasion troublesome coughing, sore throats, &c. The propriety of extracting them, when their existence is clearly ascertained, is quite obvious.

#### EXTIRPATION OF A PART OF THE UVULA.

When the uvula is permanently elongated, so as to interrupt swallowing, and occasion uneasiness in the throat, coughing, vomiting, &c. the redundant part of it should be removed with a sharp pair of scissors.\*

The fear of hemorrhage, and the recommendation of the ligature in these cases, still introduced in modern books, are absurd. Slight relaxations of the uvula yield to astringent gargles.

## CHAPTER XXIV.

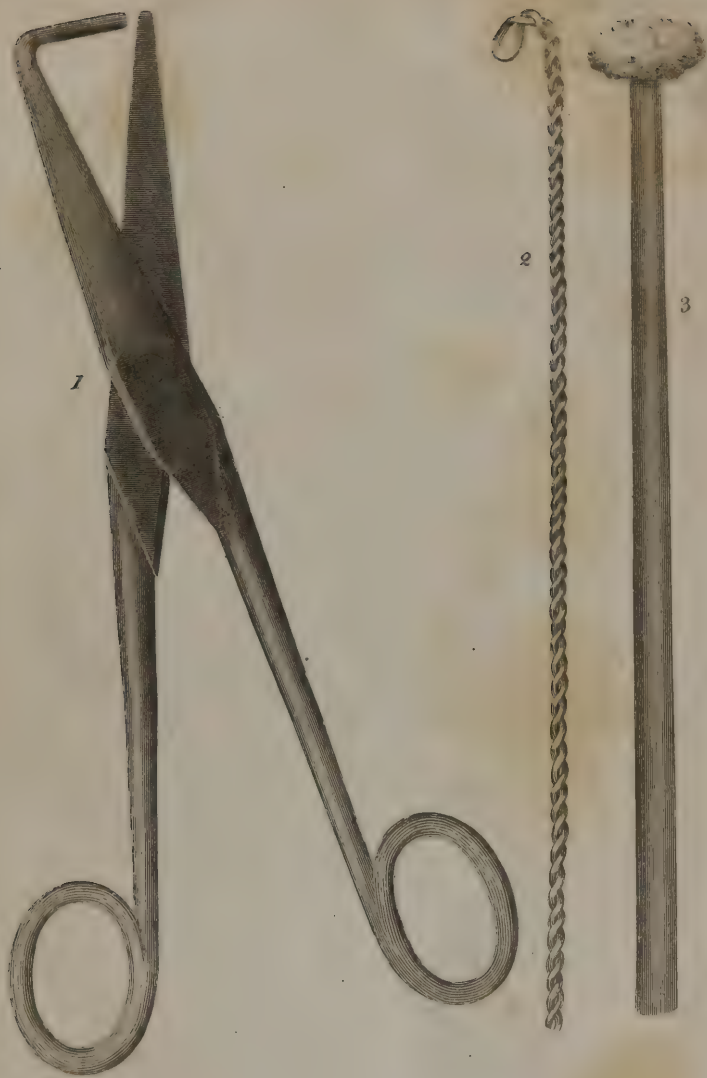
### AMPUTATION OF THE LOWER JAW-BONE.

THE frequent recovery of soldiers after the loss of the whole of the lower jaw, and extensive injury of many other parts of the face and throat by gun-shot violence, seems to have furnished the suggestion, that osteosarcoma, and some inveterate fungous diseases of the lower jaw-bone, incapable of cure, either with the knife or cautery, might be safely taken away, by amputating a more or less considerable portion of that bone. That the practice might be adopted with success, when the whole of the disease could be removed, and it was of a local nature, was first exemplified by Dupuytren, in November, 1812.† The case is described as one of cancer; osteosarcoma, and medullary exostoses, being generally regarded in France as carcinoma of the bones. The disease extended, first, from the second large grinder of the right side to the left ramus of the bone; secondly, from behind the lower lip to the root of the tongue;

tion diseased, included between the blades, from slipping out, and the surgeon is thus enabled to excise the part to the requisite extent.—Dr. Physick, Dr. Matthews, and several other surgeons, have recently published accounts of their peculiar instruments; all of which, however, appear to be only so many modifications of Desault's original contrivance.}

\* See plate 8, fig. 1.

† The portion of the lower jaw, between the left angle and the centre of the chin, was successfully removed by Dr. Deadrick, of Tennessee, in 1810. Amer. Med. Rec. vol. vi.







thirdly, from the lower alveolar arch to the upper, the two jaws being as widely separated as possible. The three grinders on the right side, the only teeth remaining, were buried in the tumour, from which there was a very fetid discharge. The bone was enlarged to thrice its natural size, and its interior was principally occupied by a sarcomatous mass, which had three projecting portions, one blocking up the mouth, and protruding out of it; the two others jutting out under different points of the cheek. The tongue was forced backward by the tumour, so that respiration and speech were rendered difficult. Mastication was also very painful, and, indeed, could scarcely be performed at all. No aliment could be introduced into the mouth, unless the right commissure of the lip were drawn to one side, away from the tumour. The saliva was poured out in great quantities; the glands of the neck were free from disease; and so was every part of the integuments. Notwithstanding repeated attempts to extirpate the disease, both with the knife and the cautery, it had been continually getting worse for fifteen years, that is to say, ever since its commencement; and the patient was now quite in a hectic state.

The following is the mode in which Dupuytren operated: M. Lisfranc compressed each of the labial arteries against the bone, near the lower part of the anterior edge of the masseter. Dupuytren took hold of the right side of the lower lip, with the thumb and forefinger of his left hand; while Breschet held the opposite side of this lip in the same manner. Dupuytren now made an incision completely through it, from the middle of its red border, and extended the cut as low as the os hyoides. The two flaps were then detached from the swelling; the utmost care being taken, however, not to separate any part from the bone that betrayed the slightest appearance of disease. The labial arteries, embedded in the muscles, were easily avoided. The two flaps were then reflected outwards, and held by the assistants; while, with the view of more conveniently amputating the bone, Dupuytren detached its inner surface from the soft parts with which it was connected. This was accomplished by carrying the scalpel along the inner side of its basis, nearly as far as each ramus, where the saw was to be applied. The bone having been fixed, it was sawn through on both sides, one inch from its angles, by means of a small short saw provided with a handle. Hitherto the bleeding had been very trivial. The next measure consisted in dissecting away every particle of the disease about the root of the tongue: the bleeding that now arose was checked by the pressure of the fingers on the branches of the submental and lingual arteries, which were much larger than natural. At length, the trunk of the submental artery was tied, and the rest of the bleeding stopped with

the cautery. Suffice it to add, that, in six weeks, the parts healed up so favourably, that the loss of the jaw-bone to the extent described, could not be suspected from the appearance of the face. Two small exfoliations occurred; but no disposition to tetanus ever showed itself, notwithstanding the laceration of the inferior dental nerves.

Dupuytren has proposed another method of performing the operation; the first incision has the same extent and direction as that above specified. The external maxillary artery is then to be pushed backward over the edge of the masseter, when a scalpel is to be plunged into the soft parts immediately in front of the vessel, and an incision extended transversely until it joins the first. A third incision is to be made on the opposite side, in a similar manner. Thus, four flaps are produced, which are to be raised as far as their bases. This plan has the advantage of enabling the surgeon to expose more conveniently the whole body of the jaw-bone, and as M. Lisfranc observes, it should be preferred when a large portion of the bone is to be amputated. Dupuytren has demonstrated, that, by this method, the lower jaw-bone may be sawn on a level with its rami, without the labial arteries being wounded.\*

The remainder of this chapter must be limited to a notice of some peculiarities in the methods adopted by other surgeons, who have had occasion to perform this operation.

Dr. Mott, of the United States, undertook it on a young woman, in November, 1821, for a very similar disease to the preceding, but occupying a still greater extent, and having adhesions to the soft palate, &c. As, in the proceedings which he contemplated, the principal branches of the external carotid would be wounded, he judged it most prudent to begin with putting a ligature round the carotid trunk, a step which he thought would also tend to lessen the inflammation to be apprehended from the violence which would be unavoidably done to the tongue, palate, and pharynx. The carotid having been taken up, the removal of the jaw was postponed till next morning.

An incision was begun over the condyloid process, opposite the lobe of the ear, carried down over the angle of the jaw in a semicircular direction, then along the lower part of the tumour, which rested upon the thyroid cartilage, and it ended on the chin, about half an inch beyond the angle of the mouth. The termination of this incision was just above the attachment of the under lip to the bone, and the mouth was laid open by it. Dr. Mott now extracted the second incisor tooth of that side, as it was in a sound part of the bone, and, after separating

\* See Dict. des Sciences, Med. t. xxix. p. 431.

the soft parts from the side of the chin, and laying bare the bone, he introduced from within the mouth, through the wound, a narrow saw, about three inches long, resembling a keyhole saw, and thus divided the jaw-bone from above downwards.

The lower part of the tumour was then laid bare, by cutting through the mylo-hyoid muscle, and the flap of the cheek carefully separated and turned up. This fully exposed the whole extent of the tumour, as it rose upwards to the *os malæ*. After the integuments had been carefully dissected from the parotid gland, the masseter was detached from its insertion, until the edge of that gland was arrived at, when, after separating a thin layer of the fibres of the latter muscle, Dr. Mott readily raised the parotid without wounding it. The lower jaw-bone was now laid bare, just below its division into two processes, and it appeared sound. To facilitate the sawing of the bone, it was necessary to make a second incision, about an inch long, close to the lobe of the ear, and terminating at the edge of the mastoid muscle. Then, with a fine saw, smaller and more convex than Hey's, Dr. Mott began to saw through the bone obliquely downwards and backwards, and finished with one less convex. The latter part of the sawing was done with great caution, to avoid the laceration of the inferior maxillary nerve. When the bone had been sawn through, the two processes were observed to be split asunder, and the coronoid to be drawn up by the action of the temporal muscle.

An elevator was now introduced into the division of the bone at the chin, by which means the diseased portion was raised. With a scalpel, passed into the mouth, the tumour was next separated from the side of the tongue, as far back as the posterior fauces, and also from the *velum pendulum palati* and pterygoid processes. In this manner it was so considerably loosened, that it could be turned upon the side of the neck. It was then separated from the parts below the base of the jaw, and from the pharynx; its detachment was also completed at the posterior angle, the operator carefully avoiding the trunks of the internal carotid, and deep-seated jugular vein, which were both exposed.

The diseased mass, being thus separated above and below, was turned up, the pterygoid muscles detached, and the third branch of the fifth pair of nerves divided, from below, a little above the foramen at which it enters the bone.

In the operation, very little blood was lost. Only two large arteries, viz. the facial and lingual, were divided; but a smaller one, near the angle of the jaw, was tied. The flap of the cheek was brought down, and secured with sutures and adhesive straps. The patient recovered with little deformity.\*

\* See A. Burn's *Surg. Anat. of Head*, &c. ed. 1824, by Pattison.



Dr. Mott's method seems calculated for cases in which the tumour is of very great extent, though only one side of the bone itself is affected. The tying of the carotid was, perhaps, unnecessary.

In 1823, Dr. M'Clellan, of Philadelphia, amputated the body of the lower jaw-bone, affected with osteosarcoma. The whole of its substance, in front of its angles, was enormously enlarged, projecting downwards in front of the neck, and backwards into the throat, attended with an enormous swelling that extended upwards from the inner surface of the bone, and protruded outwards, so as to look exactly like an enlarged tongue. It rose above the molar teeth, pressed firmly against the roof of the mouth, and quite overlapped the incisors, which were concealed in its substance. Its posterior limits could not be discerned; but, on pressing it down with a spatula, the apex of the tongue could be seen resting upon it behind. Indeed the tongue was pushed nearly into the pharynx, and hence the great difficulty of respiration and deglutition.

Dr. M'Clellan made an incision through the integuments from the left commissure of the lips, obliquely downwards and backwards, and carried it over the anterior edge of the sternomastoid muscle, so as to command the carotid artery in case it should become necessary to secure it on that side. The front edge of this incision was next raised, and the lower part of the tumour exposed. Having ascertained that the carotid need not be touched, Dr. M'Clellan dissected up the integuments forwards, until the whole surface of the tumour was exposed round to the opposite side. Paying no attention to the small arterial twigs, which were divided, he at once secured the facial artery, on each side, just where it emerged from the submaxillary gland. The bleeding from the small branches immediately ceased. He then dissected up the insertions of the masseters, a little way behind the tumour, and exposed the sound bone, which was now divided, on each side, with a metacarpal saw. The whole tumour was next turned outwards from the mouth, and carefully dissected from the under surface of the tongue, the submaxillary glands, and muscles on each side. A part of the sublingual glands, and a considerable portion of the left submaxillary, appearing unsound, were taken away. Only three more arterial twigs required ligatures. Lastly, the flap was laid down in its natural situation, and kept there with sutures and adhesive plaster; the large cavity under the tongue being partly filled with lint, so as to support the loose skin. This operation, which reflects great credit on Dr. M'Clellan, was unfortunately followed by a return of the disease, of which the young patient (a girl six years of age) ultimately died.\*

\* {Mr. Cooper has omitted the most interesting part of the above cited

Dr. Cusack, of Dublin, has favoured me with some particulars of several cases in which he has operated. In a case resembling the disease described by Sir A. Cooper, under the name of medullary exostosis, he performed one operation. The left side of the bone was affected, from the angle to the canine tooth on the right. This tooth having been previously extracted, Dr. Cusack made an incision through the lower lip, beginning at its right commissure, and terminating half an inch below the basis of the jaw. The section of the jaw was next accomplished with a small hand-saw, through the vacant alveolar space. The second incision commenced at the lobe of the left ear, and extended in the course of the outer edge of the ramus as far as the angle. A third connected the first and second, being continued along the base as far as the angle. The flap, thus marked out, was dissected from the surface of the tumour, when the masseter was seen thin and expanded over the swelling. Its fibres were next divided, after which a correct estimate could be made of the extent of the disease. As the ramus appeared sound, its outer margin was sawn, midway between the angle and condyle. A needle was now passed closely behind this part of the bone, and a chain-saw drawn by means of it into the same place. With this instrument the sawing was rapidly effected. Dr. Cusack finished the operation by pressing downwards and forwards the tumour, and the loosened portion of the jaw, and dividing the muscles close to their connexions with the bone. A few dossils of lint were placed in the cavity, and the edges of the wound brought together with sutures and sticking-plaster. The bleeding was inconsiderable, no large vessels having been injured.

case. The patient not only recovered from the operation, but she lived almost a year afterwards, enjoying perfect articulation, and a very useful degree of mastication. Dr. M'C. took especial pains to promote an abundant growth of granulations in the place of the tumour, into which lines of ossification soon extended, on either side, from the exposed surfaces of sound bones. A new bony substance was thus formed on both sides, almost as far forwards as the upper *cuspidati*, the interspace in the front being filled up with a dense substance, produced by the induration of the granulations of that part.—The plate, No. 9, which Mr. C. republished, in his last edition, from the Medical Review, gives an accurate view of the appearances before and after the operation. In the former American edition, this plate was omitted by “a Physician of Philadelphia,” who acted as editor for the publishers. But the plate was not only omitted—tergiversation was resorted to for the purpose of inducing the reader to suppose, that in the London edition it depicted one of Professor Mott's operations, instead of the one to which it actually refers. It is unnecessary to comment on such conduct. It was but a part of the system of tactics in medical warfare, which the intelligence of our community is beginning to appreciate.

Dr. Cusack has removed large portions of the lower jaw in no less than four instances, the amputation having been performed in two of them at the joint itself. In doing this, he says, the preliminary steps were, in every respect, similar to those of the operation above described. After dividing the anterior portion of the bone, however, he found the volume of the tumour such an impediment to the further proceedings, that he was obliged to make a second section above the angle. In one example, the ramus was divided, and the processes removed separately. In a second case, they were removed together. The condyle was removed by opening the front of the capsular ligament, forcing the condyle out, and making the requisite incisions for its separation with a blunt-pointed bistoury. Dr. Cusack has recently heard from the first patient, whom he operated upon in June, 1824; she enjoys good health, but cannot chew solid food. In another case, where the chin was preserved, the patient enjoys full power of mastication. From the foregoing accounts, the surgeon may learn the various ways of effecting the removal of considerable portions, or, if necessary, even of the whole lower jaw-bone. The choice of a method must depend upon the circumstances of the case. The most simple is that adopted by Dupuytren, which seems well adapted for examples, in which only the central portion of the bone is diseased. When the disease extends far towards each ramus, the second plan, suggested by Dupuytren, would be eligible. When the disease is chiefly on one side of the face, but the tumour very large, and it is necessary either to saw the ramus high up, or to take the condyle out of its socket, the other methods, of which a description is given above, are entitled to consideration.\*

## CHAPTER XXV.

### WOUNDS OF THE THROAT AND NECK.

IN these cases, it is useful to recollect, first, that the arch of the aorta lies in the upper part of the chest, in front of the trachea, and that where the carotid arteries quit the chest to run

\* {The amputation of large portions of the lower jaw has been performed by Lallemand, Lizars, Simons, Bachelder, Wagner, and Randolph, and repeated in several other cases by Professors M'Clellan and Mott.}



up the neck, they are scarcely at the sides of the trachea, but rather in front of it. However, as they get higher, they incline to the side of this tube; and on their arrival near the angle of the jaw, where they begin to give off their branches to the head and neck, they even lie rather behind the side of the larynx. Hence, we see the reason, why a wound at the lower part of the neck is very often fatal, while one higher up is generally less dangerous. The suicide rarely strikes at the lower part of the neck, and it is from the accidental circumstance of his cutting very high up, near the chin, that the carotids escape.

It should be remembered, that the carotid artery, the great jugular vein, and eighth pair of nerves, lie very near each other, inclosed in a common sheath of cellular substance; that the eighth pair are nerves of the highest importance, because they are distributed to organs, whose functions are essential to life; and, consequently, that a wound of these nerves is more perilous than a wound of the brain itself. Such an injury, as Mr. John Bell has observed, would generally settle at once all questions about the way of managing wounds of the carotid artery, or of the great vein.\*

I would not assert, as Mr. John Bell has done, that it is impossible to cut through the trachea, without wounding the carotid artery, the jugular vein, and the eighth pair of nerves; but, I fully join him in the belief that such an accident cannot be frequent. How then are we to explain the many cures which are alleged to have taken place, notwithstanding a division both of the windpipe and of the *œsophagus*? We are to account for some of these extraordinary narratives in the manner pointed out by the preceding writer. "The fact is, that neither the *œsophagus*, nor the trachea, is touched in the least degree, but the wound is much above them, for a suicide always strikes immediately under the chin. This wound, as far as I have observed, commonly falls in the line which divides the neck from the chin, that is, the place where the *os hyoides* lies, and he commonly cuts the *os hyoides* away from its connexion with the thyroid cartilage, or *pomum Adami*. In that case, the thyroid cartilage, forming the uppermost part of the larynx, is not touched; the *rima glottidis* lies below the wound quite safe. It only separates the larynx from the root of the tongue; it is properly a wound in the root of the tongue; it is rather a wound of the mouth, than of the throat; and when the food comes out, along with the spittle and froth, it is by rolling over the root of the tongue."†

That both the trachea and *œsophagus*, however, may be some-

\* See John Bell's Discourses on Wounds, edit. 3. p. 415.

† On Wounds, edit. 3. p. 417.

times cut, without the par vagum or large blood-vessels being hurt, is a fact which my own observations will not permit me to doubt. I have seen more than one instance, in which the wound was situated much lower than the point mentioned by Mr. John Bell, and yet both air and food issued from the cut. But, if I were mistaken in the nature of these accidents, still many facts of the same kind, recorded by able and judicious surgeons, prove the possibility of a wound both of the trachea and œsophagus, without injury of the par vagum, carotid, or internal jugular vein.\*

In wounds of the upper part of the throat, it is the superior thyroid artery that is most frequently cut. After quitting the external carotid at the angle of the jaw, it passes along the side of the upper part of the trachea, inclining forwards towards the thyroid gland in its descent, and hence its great exposure to the edge of the razor. The bleeding from it is profuse, and, if not speedily stopped, is as fatal as hemorrhage from the carotid itself. In some cases, the bleeding also proceeds from the lingual artery, or its branches.

The carotid artery has now been so frequently tied with success, and the best way of taking it up is so well known, that I shall not expatiate upon these topics again; but merely refer to the chapter on aneurism. The necessity of instantly tying this vessel, when wounded, is unquestionable, as well as the occasion for two ligatures, one above, the other below, the aperture in the artery. Unfortunately, so rapid and profuse is the bleeding, that the patient mostly dies in a few seconds, before any surgical assistance can be obtained.

According to Richter, the internal jugular vein has been tied with success; and small wounds of it may be healed by means of a graduated compress, retained on the part with a bandage, or, if that prove irksome, with the finger. One thing, however, is essential; namely, the pressure must on no account be discontinued before the wound in the vessel is closed.†

Pelletan once saw a wound of the throat, which proved fatal in consequence of hemorrhage from the external jugular veins; and another curious instance, in which a boy, who was convalescent after a cut of his throat, suddenly fell down in a state of suffocation, and died: dissection showed that the left side of the epiglottis had been detached from the glottis and root of the tongue, and that in this loose unconnected state, it had fallen into the rima glottidis, and caused instantaneous suffocation.‡

Wounds of the trachea are either simple or complicated. In

\* Desault's Journal; Saviard, Obs. 58; Hennen's Obs. on Military Surgery, p. 386, &c.

† Anfangsgr. der Wundarzneykunst, b. 4. p. 173.

‡ Lévillé, Nouvelle Doctrine Chirurg. t. i. p. 342.

both cases, there is an emission of air from the wound, loss of the voice, and sometimes emphysema. Injuries of the windpipe, not complicated with hemorrhage, emphysema, or loss of substance, are generally easy of cure. If the wound be of a certain size, and attended with hemorrhage, the first indication is to tie the bleeding vessels, and prevent the inconvenience and danger\* which would result from the entrance of blood into the windpipe. With this view, some authors recommend us not to close the external wound while any oozing of blood continues, so that this fluid may readily be discharged.† At all events, the most useful measures for this purpose are tying any large bleeding vessels, and bringing the edges of the wound in the trachea into contact, by a suitable position of the patient's head, and, if requisite, even by a suture.

The greater sensibility of the larynx, its complicated structure, and the number and size of its blood-vessels, render wounds of it more dangerous, than those of the trachea. They produce more irritation, and are generally attended with a convulsive cough. In general, however, simple wounds of the thyroid cartilage heal favourably.

Transverse wounds, only extending through the front half of the upper part of the trachea, generally end well; for they mostly leave nerves and vessels of consequence untouched. Loss of voice; the entrance and exit of air through the wound; and sometimes an emphysematous swelling, are immediate consequences of the injury. Wounds of this description made by gun-shot violence, are of a more serious nature; but even they not unfrequently terminate well. In most instances, transverse wounds of the trachea, not dividing it completely through, may be cured by bringing the patient's chin downward and forward towards the sternum, and maintaining the head in this posture with pillows, by which means the edges of the wound in the trachea will be kept in contact. However, when the division of the trachea is extensive, a suture may be employed with advantage. In the opposite circumstance, it should be dispensed with as unnecessary, and aggravating the cough, with which the patient and the wounded parts are generally disturbed. When the severity of this symptom is owing to an inflammatory state of the wound, it may be mitigated by bleeding and soothing remedies. When it appears chiefly to depend upon a copious secretion of mucus in the larynx, or trachea, the almond emulsion, spermaceti mixture, and opium, may be given with beneficial effect.

In order to prevent the discharge and blood from falling into

\* See Wilmer's Cases and Remarks in Surgery, p. 92.

† Lassus, *Pathologie Chirurgicale*, t. ii. p. 291.

the trachea, a circumstance that always excites violent coughing, some practitioners direct the patient to lie on his side, with his face turned downwards.\* However, nothing prevents these occurrences more effectually, than keeping the edges of the wound accurately in contact; and the patient's head may be much more steadily supported forward, when he lies on his back, than when he is on his side.

When the upper portion of the trachea is detached from the lower, and the wound is not immediately fatal from injury of other important parts, the bleeding vessels are first to be tied, and the two ends of the windpipe brought together. Here the employment of a suture is warrantable, on account of the considerable separation of the parts, and the inefficacy of position alone to prevent it. A flat broadish ligature should be employed; the needle should not be introduced through the lining of the trachea; and if the chin be kept moderately inclined towards the breast, one stitch will suffice.

When the whole diameter of the trachea is cut through, the French surgeons propose the introduction of a flexible catheter, from one of the nostrils into the larynx and trachea, in order to insure a passage for respiration, which, they say, without this means, is liable to be intercepted when the outer wound is closed, in consequence of the two portions of the windpipe being separated and not corresponding.† This, however, is not the practice to which I should give a preference; first, because the introduction of a flexible catheter is not always easy of accomplishment; secondly, because its use in this way is constantly productive of considerable irritation; and, thirdly, because the employment of a suture appears a better means of preserving a passage for the air, by keeping the ends of the trachea together.

With respect to the introduction of a flexible catheter, from one of the nostrils into the œsophagus, for the purpose of giving food and medicines, without disturbance of the wounded parts, I consider the method entitled to praise, in all very bad wounds, either of the larynx, trachea, pharynx, or œsophagus; for, in deglutition, the sudden and almost convulsive action of the muscles, concerned in the elevation and depression of the larynx, has the worst effect in preventing the favourable union of the parts. But, if nourishment and medicines be injected down the œsophagus through an elastic catheter, this hurtful action of the muscles is entirely prevented. I have seen the instrument left in the œsophagus, in several cases, without any annoyance or irritation; and the requisite medicines and nour-

\* *Mém. de l'Acad. de Chirurgie*, t. i. p. 581.

† *Richerand, Nosographie Chir.* t. iv. p. 170. edit. 4.



ishment were given with the utmost convenience. The military surgeon, in particular, should never be without several of these catheters; and whoever has read Larrey's instructive work,\* must know, that, in bad wounds of the throat, the patient's only chance of recovery frequently depends upon the skilful use of these instruments.

Gun-shot wounds of the neck, lacerating the trachea, frequently terminate well.† Ravaton mentions instances, which were also followed by a recovery of the voice. To these cases sutures are not at all applicable. The adoption of the position above recommended, and the application of simple dressings, or an emollient poultice, contained in a fine linen bag, are the chief local measures. Bleeding, and antiphlogistic remedies of every description, will be generally proper. Opium is not to be forgotten, as a useful medicine; for it not only appeases the cough, but tends to quiet the great mental and nervous anxiety, which, in examples of attempted suicide, precede the wound, and generally continue after it in a very aggravated degree. Indeed, many of the unhappy persons, who attempt to destroy themselves by cutting their throats, retain for a good while after the failure of the first attempt, a determination to take another opportunity of accomplishing their fatal purpose. Hence they cannot be too closely watched, and nothing like a razor or knife should ever be put within their reach. Vigilance is also necessary, in order to keep the dressings from being displaced, and the wound torn open again, by the restless movements, or actual violence of the patient.

Schmucker treated small wounds of the pharynx and upper part of the œsophagus with success. Wounds dividing half, or even two-thirds of the tube, are also stated to have been cured.‡ The possibility and impossibility of a cure must obviously depend upon the nature of the other parts which happen to be injured.

Incised wounds of the forepart of the œsophagus, must derive additional danger from the simultaneous division of the whole circle of the trachea; and indeed, so much would the internal jugular vein, par vagum, and carotid artery, be exposed to the edge of the knife in a cut of this kind, that it is difficult to conceive how they can ever escape. Mr. John Bell believed that they never could; and were it not for a few cases which I have seen myself, and for some examples published by Desault, whom we cannot suppose apt to mistake a wound of the mouth for one of the trachea and œsophagus, I should be inclined to

\* *Mém. de Chir. Militaire*, 4 tomes, 8vo.

† *Mém. de l'Acad. de Chirurgie*, tom. i. p. 576. 4to.

‡ *Op. cit.* tom. iii. p. 151, &c. edit. 12mo.

adopt Mr. J. Bell's opinion. However, a punctured wound, penetrating the side of the œsophagus, may not be complicated with injury of the trachea.

Should the case be one that leaves the great vessels uncut, though the injury of the œsophagus be complicated with a complete division of the trachea, the surgeon may lessen the space between the edges of the wound in the œsophagus, by bringing the divided portions of the trachea together. This effect must result from the manner in which the posterior part of the wind-pipe is connected with the œsophagus. But, for this purpose, a suture is only to be used in such a state of the wounded trachea as has been already mentioned, and in all other cases a proper position of the head, and the use of adhesive plaster to the external wound, are the means with which the surgeon ought to be content.

In cases of wounds of the œsophagus, the injection of nourishment and medicines, through a smooth tube of a suitable size, introduced down the passage, was recommended as long since as the time of Ravaton. In one case of paralysis of the œsophagus, that occurred in this country, a small fresh eel-skin was passed down the canal, by means of a whalebone probang, in order that nourishment and medicines might be injected into the stomach.\* The many cases, however, in which Desault advantageously employed an elastic catheter for the same objects, had a principal influence in establishing the practice. The instrument was introduced through one of the nostrils, and was often left in the œsophagus several days together.†

Sometimes this practice is absolutely necessary in complicated wounds about the face; like those produced by the discharge of a pistol in the mouth, attended with extensive laceration of the tongue, cheeks, and fauces, great swelling of all the parts about the throat, and a comminuted fracture of the lower and upper jaw-bone. I believe, indeed, that in all bad fractures of the lower jaw, the introduction of a flexible catheter, from one of the nostrils into the œsophagus, is a judicious measure, because the action of deglutition has the worst effect in displacing the broken bone, and disturbing the process of union.

Gun-shot wounds of the neck sometimes occasion an immediate loss of the use of the arm on the affected side; a circumstance depending upon injury of the cervical nerves.

Deep sabre-cuts of the muscles at the back of the neck are sometimes followed by a paralytic weakness of the lower extremity, corresponding to that side of the body on which the

\* Hunter, in Trans. of a Society for the Improvement of Med. and Chirurgical Knowledge.

† See the Journal de Chir. and Bichat's Œuvres, Chir. de Desault, tom. ii.

wound is situated. In some instances, the limb becomes emaciated; in others, it is well nourished. Flajani first particularly pointed out the occurrence, as common after such wounds; and many examples of it are recorded by Larrey. In two cases, Flajani tried issues in the loins, liniments, and the internal exhibition of the *tinctura lyttæ*, but without success.\* In some of Larrey's cases, the wounds were followed by a wasting of the testicles, and an entire loss of all venereal desire.

## CHAPTER XXVI.

### FOREIGN BODIES IN THE ŒSOPHAGUS,

REQUIRING extraction, are such as might create bad symptoms, if pushed down into the stomach, in consequence of their hardness, indissolubility, pointed shape, or other hurtful qualities. On the other hand, those which are not likely to produce harm in the alimentary canal, and are capable of being digested, may be at once pushed down into the stomach.

Foreign bodies most frequently lodge about the upper or lower orifice of the Œsophagus; seldom in its middle portion. When low down, the surgeon is often compelled to force them into the stomach, though their quality is such as would render their extraction desirable. In many instances, they are situated in the pharynx. Hence, it is an important rule, always to press down the tongue, and examine the back of the throat, before any thing else is attempted. Thus, they may frequently be discovered, and extracted with the fingers, or forceps, when, from the patient's account, one would conjecture that they had descended much further.

When a foreign body is situated about the upper orifice of the Œsophagus, it may often be felt with the surgeon's finger, and if incapable of being removed with it, it may sometimes be extracted with a pair of curved forceps.

A common extracting instrument is a kind of hook, constructed of flexible wire, so doubled and twisted together, that the bent end forms a noose, in the shape of a hook.†

Small bodies, like needles, fish-bones, &c. are generally more

\* Collezione d'Osservazioni e Riflessioni di Chirurgia, tomo i. p. 46, &c.

† See fig. 2, plate 8.

easily extracted with a piece of sponge, introduced beyond them. The art of employing compressed sponge, in the most advantageous manner, consists in taking a piece about the size of a chesnut, and introducing a strong ligature through it. The ends of the ligature are then to be passed through a flexible catheter, and fastened to that end of it which the surgeon holds. The sponge is then to be introduced down the œsophagus beyond the foreign body, and water is to be injected down the tube, in order to wet the sponge and make it expand. The ligature is then to be firmly drawn, for the purpose of pressing the sponge against the extremity of the tube, and making it spread itself out in a still greater degree. The tube is now to be withdrawn, together with the sponge, the instrument being twisted to the right and left, in this part of the operation.\*

When the foreign substance cannot be extracted with this instrument, a probang may be tried, to the end of which a bunch of thread is fastened, doubled so as to make an immense number of nooses. In this way, little bodies frequently admit of being entangled, and extracted, when other modes fail.

Some practitioners are in the habit of giving emetics; but this method must be improper when the foreign body is pointed, and is seldom of much use in any case, as patients usually make efforts to vomit of their own accord.

When the foreign bodies produce urgent symptoms, and cannot be extracted, it becomes necessary to push them into the stomach, whatever may be their nature or quality; and here it should be mentioned, that substances which one would imagine likely to produce alarming symptoms by being put into the stomach, frequently occasion, after they are in that organ, no dangerous symptoms, and even not the smallest inconvenience. A whalebone probang is the instrument for this purpose.

When foreign bodies can neither be extracted, nor pushed down, the consequences are not invariably dangerous. When the extraneous substance is small and pointed, it frequently excites suppuration, becomes loose, and is either carried into the stomach, or ejected from the mouth. Sometimes it makes its way to the surface of the neck, occasioning there an abscess, out of which it is extracted.

In some instances, foreign bodies, especially needles and pins, after making their way through the œsophagus, travel a great way about the body, and at length, arrive under the skin of remote parts, behind the ears, at the shoulders, feet, &c. where they occasion an abscess, that leads to their discovery and extraction. Surgical authors have recorded a variety of examples, in which pins and needles, after being swallowed, have conti-

\* See fig. 3, plate 8.



nued in the body many years. In one instance, in particular, a needle that had been swallowed, remained in the body eighteen years before it made its appearance under the skin, during all which time not the slightest inconvenience was experienced.\*

When the foreign body is large, it totally impedes deglutition, dangerously obstructs respiration, and can neither be pushed down into the stomach, nor extracted by the mouth, the only means of saving the patient's life is œsophagotomy; an operation that has rarely been performed on the living subject. It is directed by Lisfranc to be done as follows: the patient's head having been inclined backwards, an incision is to be commenced at the inner edge of the left sterno-mastoid muscle, opposite the superior edge of the thyroid-cartilage, and continued down to the lower edge of the cricoid. An assistant is now to draw the carotid sheath towards the outer side of the wound, while the operator cautiously dissects through the cellular substance close to the trachea, until the œsophagus is exposed, where it inclines to the left side of the windpipe. A long, slightly curved cannula, with a grooved stilet, is now to be introduced from the mouth down the œsophagus, and its point being inclined to the left, may readily be felt in the wound. The stilet is then to be pushed forwards through the œsophagus; the operator ascertains, by passing his finger along the concave end of the instrument, that no arterial branch lies over it; and then puts a bistoury into the groove, under the guidance of which the œsophagus is opened. The foreign body, lodged in this canal, is now to be extracted with a pair of forceps.†

## CHAPTER XXVII.

### OF LARYNGOTOMY AND BRONCHOTOMY.

SOMETIMES, the only chance of life depends upon an opening being made in the larynx, or trachea, without the least delay, either for the purpose of extracting foreign bodies, from the larynx, threatening suffocation, or of enabling the patient to breathe, until some existing impediment to the natural mode of respiration has been removed. The first of these operations is termed *laryngotomy*, a method which, though not generally

\* See Précis d'Observations sur les Corps Etrangères Arrêtés dans l'œsophage, &c. par M. Hevin, in Mém. de l'Acad. de Chir. tom. i. 4to.

† See Averill's Short Treatise on Operative Surgery, p. 49.

preferred in this country, has had several distinguished advocates on the continent, especially in France. It consists in making a transverse incision through the crico-thyroid membrane, or in slitting open the thyroid cartilage longitudinally. The making of an opening in the trachea is named *tracheotomy* or *bronchotomy*, and is sometimes executed by making an incision between two of the rings of the trachea, parallel to them; but, generally, by making a perpendicular division of them.

Writers, who give the preference to laryngotomy, offer the following considerations in its favour: the only parts cut are the skin, cellular substance, and crico-thyroid membrane; the little risk of hemorrhage, a few small veins, and the superior laryngeal artery, being the only vessels exposed to the knife; the greater facility with which the larynx is fixed, than the trachea, which, being more deeply situated, and movable, may slip away from the knife, and even the carotids be wounded; an instance of which is related by Bichat.

As to the question, which operation is most suited to the objects in view, Bichat endeavours to prove that laryngotomy always answers as well, and sometimes better than tracheotomy. If the design be merely to make an opening for the air, one situation will do as well as the other. If the extraction of a foreign body be the object, laryngotomy must evidently be the most applicable, supposing the substance to be lodged between the edges of the glottis, or in the ventricles of the larynx.

While Ferrand was surgeon of the Hôtel Dieu, a man was brought to it with urgent symptoms of suffocation, caused by a stone that had fallen into the glottis. Tracheotomy was performed, but merely a little blood and mucus was discharged. The patient died, and on examination, a triangular stone was found, two angles of which were lodged in the ventricles of the larynx, while the other projected at the glottis. In this example, laryngotomy would have saved the man's life. When a foreign body in the trachea is loose, it is mostly at the upper part of it; but, if it should happen to be fixed, and lower down, the advocates for laryngotomy assert, that it may even then be readily extracted, by extending the cut through the cricoid cartilage, and using a pair of curved forceps.

Whatever differences of opinion may be entertained, however, respecting the advantages of laryngotomy, in examples of foreign bodies in the larynx, none can exist in cases of deeply seated tumours between the trachea and œsophagus; a foreign body far down the latter passage; or obstructed respiration from the swelling attendant on severe wounds of the throat: here tracheotomy is alone applicable. I also agree with Flajani in condemning laryngotomy, in croup and angina, be-

cause the wound should be made away from the seat of inflammation.\*

When laryngotomy is preferred, and making an opening to enable the patient to breathe, is the only object, a transverse incision in the crico-thyroid membrane will suffice. The skin being made tense, and the larynx fixed, the skin and cellular substances are to be divided to the extent of an inch, from the lower part of the thyroid to the cricoid cartilage, between the two sets of sterno-thyroidei and sterno-hyoidei muscles. The surgeon is then to dissect carefully down to the membrane. The puncture should be made rather towards the cricoid cartilage, so as to avoid an arterial branch, which usually runs along the lower edge of the thyroid cartilage. Should the bleeding from any vessel prove troublesome, a ligature ought to be applied. Lastly, a short, flat silver tube is to be introduced, and being covered with a bit of gauze, is to be fixed in its place with ribands. Care must be taken to withdraw and clean it as often as it becomes obstructed with mucus. Instead of a tube, the removal of a thin slip of the membrane, as suggested by Mr. Lawrence with regard to the trachea in bronchotomy, might be a more convenient practice for the purpose of insuring a sufficient temporary opening for respiration.

When laryngotomy is performed for the extraction of foreign bodies, a scalpel, a director, a straight and a curved pair of forceps, are the requisite instruments. The skin and cellular substance are first to be divided, from the upper part of the thyroid, to the base of the cricoid cartilage. The membrane, between these two parts, is to be opened, and a director being passed into the aperture, the front of the thyroid cartilage is to be slit open. On the edges of the wound being now separated with the forceps, the foreign body, if it be loose, will immediately escape with the air. Should it be fixed, it must be taken out with the curved forceps. When it is engaged in the glottis, it will be most convenient to push it upwards into the mouth. When it has passed far into the trachea, the extraction may be difficult, unless the wound be enlarged by dividing the cricoid cartilage.

In old persons, the cartilages of the larynx may be ossified, and difficulty may be experienced in dividing them; nor can the thyroid cartilage be slit open, without some risk of injuring the chordæ vocales. In cases of cynanche laryngea, the thickened and swelled state of the lining of the larynx,† and the impropriety of cutting the inflamed parts themselves, are strong

\* Flajani, Collezione d'Osservazioni e Riflessioni di Chirurgia, t. iii. p. 241.

† Med. Chir. Trans. vol. vi. p. 249.

objections to this mode of operating, which is not more eligible when the object is to inflate the lungs.

The following is the common method of performing bronchotomy. When a free opening in the trachea is requisite, an incision may be made in the integuments, beginning just below the inferior lobes of the thyroid gland, and extending directly downwards about two inches. Each sterno-thyroides muscle is then to be pushed a little towards its own side of the neck, and a longitudinal wound, of the necessary size, is to be made in the front of the trachea. The knife must not be carried either to the right or left, in order to avoid all risk of injuring the large blood-vessels; and the incision ought never to extend too near the first bone of the sternum, lest the subclavian vein be wounded.

When the design of the operation is merely to make a passage for the air, the incision in the trachea need not exceed half an inch in length. In some cases, the introduction of a tube into the opening, produces such irritation as cannot be endured: in this circumstance, Mr. Lawrence recommends the removal of a thin slip of the trachea, which will leave an artificial opening sufficient for respiration.\*

## CHAPTER XXVIII.

### WRY-NECK.

IN this complaint, the head is drawn towards one of the shoulders. In general, the face is turned towards the opposite side; but, occasionally, towards that to which the head inclines. The affection, when in a high degree, renders the head quite immovable, so that neither the patient, nor any other person, can place it in its proper position. Hence, when the patient wishes to look in any direction, except immediately before him,

\* {To avoid the irritation caused by the introduction of the tube within the trachea, a curvilinear or oval shaped ring may be used; the outer margin made concave, to prevent the edges of the incision from slipping off behind it, and the anterior part of the ring projecting laterally in the form of a plate, similar to the plate of the laryngotomy tube.—The small silver wire doubled and bent in the form of a broad hook, one of which hooks is attached to each side of the incision, and kept apart by pieces of tape, fastened to them, and tied behind the neck; having been used by Professor G. M'Clellan for several years past, and have the advantage of being readily made by the surgeon for every case requiring the operation. }



he is necessitated to turn his whole body. Sometimes the head can be moved, but not brought into a straight posture. In other instances, the patient, with exertion, can manage to keep his head straight for a short time; but it soon becomes inclined again towards the shoulder.

Generally, on the side towards which the head leans, the neck seems plump, the strong shortened muscles being bulky, and affected with considerable spasm; while the other side, where the neck is convex, exhibits no strong rigid muscles, or, at all events, so little of this appearance, that, notwithstanding its convex form, it is obviously less fleshy. When the disease has continued long, and attained a serious degree, its effects extend to the head. On the side, where the irregular action of the muscles is strongest, and where consequently the head is most drawn downwards, the half of the face is usually more or less contracted, and weaker than the opposite half, the zygomaticus major, buccinator, masseter, and other muscles, being considerably less prominent.

The complaint is usually owing to a defect in the muscles concerned in moving the head. When, however, the deformity has existed a long time, and particularly, when it began in early childhood, and continued during the growth of the body, the cervical vertebræ are sometimes distorted, and even ankylosed, in which circumstances, the case may be deemed incurable. This participation of the vertebræ in the disorder, does not always exist, even though the deformity may have begun at an early period of life, and prevailed a considerable time. Richter mentions several instances, in which wry-necks of the most unpromising description were cured; cases, in which the head had been quite immovable; the disease of twelve and sixteen years' duration; and its origin had taken place in infancy.\* Professor Jorg,† of Leipsic, assures us, that he has never seen any cases in which the complaint originated in the bones: the muscles were always the parts first concerned. According to his observations, the sterno-cleido-mastoideus is to be looked upon as the chief and original cause of the deformity, which he has never seen unattended with the particular and manifest influence of that muscle. While, says he, it is more disposed to irregular action than any other muscle of the neck, its greater strength makes it in some measure govern the rest.

The same writer does not give much credit to the opinion, that wry-neck is frequently brought on by a contraction of the skin of the neck, and of the *playtisma myoides*; although we

\* *Anfangsgr. de Wundarzn. b. iv. p. 276.*

† *Ueber die Verkrümmungen des Menschlichen Körpers, und eine rationelle und sichere Heilart derselben. 4to. Leipzig, 1816.*

know, that Mr. Gooch effected a cure by simply dividing these parts: but Professor Jorg thinks, that when these textures, or any other muscles of the neck, are shortened, it is generally as a consequence of the affection of the sterno-cleido-mastoideus, which is the part originally disordered. With the exception of cases, produced by the contraction of cicatrices, Jorg's sentiment is probably correct. With respect to a malformation of the cervical vertebræ being the primary cause of wry-neck, this author does not deny its possibility; but he has never seen an instance of it.

When the deformity follows the contraction of a cicatrix, the cure is by no means easy. A transverse incision is made through the integuments, and the head is afterwards kept in a straight posture by some mechanical contrivance, until the wound is perfectly healed. The apparatus is left off, and the distorted position of the head returns, as surely as the granulations, by which the new wound has been filled up, are absorbed. Whether the entire removal of the first scar, as suggested by Mr. Earle, or the modification of this treatment, since tried and recommended by Mr. James, of Exeter, will have better success, further experience must determine. In some instances of children, in whom the chin was nearly in contact with the breast, in consequence of the effect of severe burns, I have known considerable amendment follow the division of the longitudinal folds in the cicatrized parts.

In common examples, depending chiefly upon a loss of equilibrium between the muscles of the opposite sides of the neck, and especially upon a rigid contraction of one of the sterno-cleido-mastoidei, the usual means, which sometimes succeed, are camphorated mercurial frictions on the part, even till salivation occurs; the internal exhibition of opium, together with mercurial frictions; electricity; stimulating embrocations; the shower-bath; blisters; issues, &c. These remedies should be assisted with mechanical contrivances, for gradually bringing the head into a straight position. The best apparatus, which I know of for this purpose, is that invented by Professor Jorg. It consists of a pair of leather stays, and of a band, or fillet, which goes round the head. On the centre of the forepart of the stays is a kind of pulley, or grooved wheel, which can be turned round with a key in one direction, but not in the other, as it becomes fixed by means of a spring. From this pulley, or wheel, a band proceeds up the neck to the fillet on the patient's head, to which it is fastened directly behind the ear, close to the mastoid process. The band lies in the same direction as the lengthened sterno-cleido-mastoideus muscle, and when drawn towards the breast by means of the wheel, it produces the same effect as would arise from an increase in the action of that

muscle. In short, it pulls the mastoid process downwards and forwards towards the sternum, counteracts the opposite muscle of the same name, and rectifies the position of the head. The apparatus is to be constantly worn.

When, by perseverance in the use of this simple invention and other means, the position of the neck has been improved, the head is generally found to have a disposition to incline too much forwards; an effect, which the contracted sterno-cleido-mastoideus, and its antagonist, the band, both tend to promote. In order to hinder this, Professor Jorg removes the end of the band from the breast, carries it under the arm, and through a ring at the side of the leather corsets, or stays, and thence to the fillet on the head, where it is fastened close to the mastoid process. The ring hinders the band from chafing the axilla, and following the motions of the shoulder.\*

It is when the disease originates from a contraction of the muscles on one side of the neck, quite unattended with the smallest perceptible induration, that an operation is advised for dividing the contracted muscular fibres. This, however, must only be performed when the wry-neck depends entirely, or principally, on a contraction of the sterno-cleido-mastoideus. When the defect is situated in the other muscles, or the cervical vertebræ are altered, the operation is not advisable. When the above muscle is alone, or chiefly concerned, the face is always turned from that side to which the head is inclined; and in endeavouring to put the head in a straight position, the fibres of the muscle are rendered exceedingly tense.

Should Sharp's operation of dividing the sterno-cleido-mastoideus be determined upon, it will generally be prudent at first only to cut through the clavicular portion of it. If the surgeon should determine to cut out a part of the fibres, the incision must be made through the skin, exactly in the direction of this portion of the sterno-cleido-mastoideus.† If he means simply to divide it, a transverse wound will suffice. On this part of

\* Plate 5. Fig. 4. Professor Jorg's apparatus applied.

Fig. 5. Back View of the leather stays.

Fig. 6. Key for turning the pulley.

† { I assisted Dr. G. McClellan in an operation of this kind, which he performed on a lady, 27 years old. The distortion was excessive, and had existed from infancy. He cut down perpendicularly over the outer head of the *sterno-mastoideus*, dissected the skin up from the muscle, until he had exposed both edges, ran a grooved director under the muscle, and slit it entirely across with a bistoury. The patient was greatly benefited by the operation, and can now perform her domestic duties with ease. Mr. Kirby has published an excellent tract upon this subject, and argues forcibly in favour of the operation. }

the muscle being completely exposed, the rest of the operation is to be completed by passing a director, and blunt-pointed curved bistoury, under the place where the division is intended to be made. If a part of the muscle is to be removed, the operator may finish the operation with a pair of forceps, and a common knife. Dupuytren, in one case, passed a bistoury behind the muscle, and divided it by cutting forwards, leaving the skin uncut, in order that the patient, who was a female, might not have the disfigurement of a scar in the neck. The position of the head was then regulated by a bandage. The plan was successful.

A wry-neck may depend on paralysis, or weakness, of one sterno-cleido-mastoideus, while the other retains its natural power.

Here electricity, setons, blisters, liniments, the cold bath, and tonics, are indicated. The state of the bowels and digestive organs should also be carefully regulated. During the trial of these remedies, the head should be kept in a straight position, as paralytic muscles are more likely to recover their tone in a tense, than a relaxed state. When such treatment fails, a partial division of the healthy sterno-cleido-mastoideus, has been suggested, as a means of restoring the equilibrium of the head.

## CHAPTER XXIX.

### BRONCHOCELE,

**SIGNIFIES** an indolent enlargement of the thyroid gland; the tumour, when not accidentally inflamed, is free from pain; and in its incipient state, has a soft, elastic consistence. When it has existed some time, the gland loses its natural figure, assumes a firm fleshy feel, being firmer, however, in some places, than in others, spreading towards the sides of the neck, and sometimes attaining a prodigious magnitude. When the adjacent cellular substance, and lymphatic glands, participate in the disease, the base of the swelling may extend from one side of the neck to the other. In a few instances, only one lobe is affected.

Bronchocele is endemic in several mountainous countries; for instance, Switzerland, Savoy, the Tyrol, Derbyshire, &c. and is most frequent in young females.

When a section is made of the diseased thyroid gland, it ap-



pears to consist of many cells of different sizes, filled with a transparent viscid fluid.\*

The tumour sometimes creates no particular inconvenience; and is merely a deformity. Large bronchoceles, however, are frequently attended with considerable obstruction of the speech, respiration, and deglutition. The disease has no tendency to become malignant, and is not very liable to inflammation and its consequences, though these changes sometimes happen.

The causes of bronchocele are involved in great obscurity. At one time, it was conjectured, that drinking water, obtained from melted ice or snow, frequently gave rise to the disorder. The disease, however, is frequent in Sumatra, where ice and snow are never seen; while it is entirely unknown in Thibet, where the rivers are exclusively supplied by the melting of the mountain's snow.† Bronchocele has been regarded as a scrofulous complaint; but this doctrine is denied by Prosser, who argues, that the disease is often seen in persons entirely free from every mark of scrofula; and that, while boys are as subject to scrofulous diseases as girls, the bronchocele of this country occurs only in young females.‡

The disease, in a recent state, may frequently be cured; but, when it has existed a long time, though it may be considerably diminished, it can hardly ever be entirely removed.

The medicine, commonly given in bronchocele, used to be burnt sponge, in the dose of a scruple, two or three times a day. Sometimes it was made into an electuary with syrup; but, frequently it was prescribed in the form of a lozenge, the efficacy of which was thought to be greatest, when it was placed under the tongue, and allowed gradually to dissolve there. A mercurial purgative was usually given about once a fortnight.§

The good effects of burnt sponge have now been ascertained to depend upon the iodine which it contains. Dr. Coindet, of Geneva, has employed various preparations of the latter substance, with far greater success than ever resulted from the use of other medicines. From five to twenty drops of the tincture may be given to an adult, three times a day. Dr. Coster, who had opportunities of noticing Dr. Coindet's practice, informs us, that the efficacy of iodine is promoted by the previous application of leeches to the swelling, and a low regimen.||

\* Baillie's *Morbid Anatomy* of some of the most important Parts of the Human Body, p. 84. edit. 2; also, Prosser on *Bronchocele*, or *Derby-neck*, p. 18. edit. 3.

† See *Sketches of the Philosophy of Life*, by Sir T. C. Morgan, M. D. p. 426. 8vo. Lond. 1818.

‡ *An Account and Method of Cure of the Bronchocele*, or *Derby-neck*, 3d edit. p. 5. 4to. Lond. 1782.

§ See *Wilmer's Cases in Surgery*.

|| *Archives Gen. de Med.* Juillet, 1823.

With such treatment, external means are to be combined; as repeated frictions of the swelling with a dry towel, strong liniments, or, what is still better, the iodine ointment. Electricity and galvanism may also prove useful auxiliaries to the other means.

Accident has sometimes furnished useful suggestions in the practice of surgery: bronchoceles have occasionally festered, or ulcerated, and the result sometimes been the dispersion of most of the swelling. Hence, the plans of forming issues and setons, as a mode of cure. Valuable information, respecting the effects of setons, may be collected from a paper by Dr. Somerville, describing the practice of Quadri at Naples, and inserted in the *Med. Chir. Trans.* vol. 10; and from another paper in the eleventh volume, drawn up by Mr. Copeland Hutchison. It is evident, that the trial of a seton should never be made, except when iodine has decidedly failed, and the complaint is beginning to be oppressive by its size.

If this latter measure, or the formation of an issue, should not be deemed advisable, and the patient's life be rendered miserable, or seriously endangered by the pressure of the swelling on the trachea, œsophagus, and veins returning the blood from the head, it will be for the practitioner to consider, whether he will imitate Walther, of Landshut, and Mr. Coates, of Salisbury, in tying one or both of the superior thyroid arteries, or follow the example set by Gooch, Desault, Theden, Vogel, and Hedenus, who ventured to extirpate the enlarged thyroid gland. The latter distinguished surgeon, residing at Dresden, has performed this bold operation, at least six times, with complete success. The most essential rule in the operation would be to secure every large artery directly it was cut, so that the patient might not be lost by hemorrhage, ere the complete detachment of the swelling was effected. Now that the right method of tying large arteries is better understood than formerly, secondary hemorrhage would not occur with the frequency exemplified in Gooch's cases.

Very large bronchoceles sometimes obstruct respiration, deglutition, and the return of the blood from the head, in so serious a degree, that a surgeon would feel greatly inclined to make any rational attempt to relieve his patient, even though it might be one of a bold description. For the relief of these cases, the foregoing operations are entitled to impartial consideration, especially as they are founded upon correct principles, and have already been accomplished in several instances with success.

## CHAPTER XXX.

## WOUNDS OF THE CHEST,

ARE divided into superficial, and penetrating, The former do not materially differ from common wounds of the skin and muscles in other situations, and, therefore, do not require particular consideration.

It is frequently difficult to pronounce, whether a wound extends into the cavity of the thorax, or not. The course of many narrow stabs cannot be easily followed by a probe, because they have been received while the part was in a posture, which cannot be precisely ascertained, but in which alone their track admits of being traced with a probe, completely through the parietes of the chest. But, if the symptoms do not indicate any difference between a superficial wound of the chest, and one which just enters its cavity, no practical good can result from knowing to which description it answers, and a great deal of mischief may arise from painful examinations.

Sometimes, however, the passage of air into and out of the wound, leaves no doubt, that the injury extends beyond the pleura costalis. This symptom, which can only be expected when the wound is straight and freely pervious, arises from the alternate enlargement and contraction of the thorax in respiration. In the perfect state, the surface of the lungs is always in close contact with the pleura costalis, both in inspiration and expiration. The lungs themselves are only passive organs, quite incapable, by any action of their own, of expanding and contracting, so as to maintain their external surface in contact with the inside of the thorax, which is continually undergoing a change of dimensions. Every muscle, that is concerned in enlarging and diminishing the chest, must contribute to adapting the volume of the lungs to the size of this cavity, as long as there is no communication between it and the external air. In inspiration, the thorax is enlarged in every direction, the lungs expand, and the air, entering through the windpipe into their air-cells, prevents a vacuum. But when there is a free communication between the atmosphere and the inside of the chest, and this cavity expands, air must enter into the bag of the pleura, and the lung remain proportionally collapsed. There are several reasons why this event does not regularly take place in wounds of the chest: the principal one is, that the

opening is rarely ample and pervious enough, and is soon covered with dressings; another is, the great frequency of adhesions between the pleura costalis and pleura pulmonalis.

When, however, air has entered the bag of the pleura, through the wound, a part of it is expelled by the next expiration, in which the capacity of the chest is diminished.

It is commonly believed, that if the two bags of the pleura communicated by an opening between them, or that if the lungs were included in only one bag, instead of two distinct ones, suffocation would be the usual consequence of penetrating wounds of the chest. Bertrandi asserts, that if a free opening be made into each side of an animal's chest, both lungs collapse. Yet, this statement does not altogether coincide with certain observations, which have been published. That, in emphysema, the lung does sometimes collapse, and air fill up the space, which that viscus previously occupied, is a truth, of which there is abundant proof.\* But, in other instances of emphysema, upon an opening being made into the chest, no air was found in the bag of the pleura, the lung was seen in contact with the side of the chest, "nor did it recede when exposed."† It appears from Bremond's experiments, that not only when an opening is made into the cavity of the thorax, but even when some of the ribs are removed, the lungs still occupy their natural situation, and actually protrude at the opening during expiration.‡ It may also be concluded from other investigations, that the lungs frequently do not collapse, when the cavity of the chest is exposed in a living animal;§ a fact, which Mr. Abernethy had also an opportunity of ascertaining in a case, where he divided the pleura costalis in an instance of supposed hydrothorax, in which no water was found.|| And in opposition to the assertion of Bertrandi, recoveries have followed wounds on both sides of the thorax, larger than the orifice of the glottis.¶ Herniæ of the lungs from wounds of the thorax, are additional proofs, that these organs do not invariably collapse even though the opening be large. The circumstances, however, which account for the collapse of the lungs in some cases, and not in others, are at present quite unexplained, except inasmuch as the event may be influenced by the presence of adhesions, and the size, and direct or indirect course of the wound. If a single unequivocal instance be found, in which a free and direct opening may be made in the thorax, without inducing a collapse of

\* See Abernethy's Surgical Works, vol. ii. p. 171. edit. 1811.

† Op. cit. p. 175.

‡ Mém. de l'Acad. des Sciences, an. 1739.

§ Norris, in Mem. of the Med. Soc. of London, vol. iv. p. 440.

|| Surgical Works, vol. ii. p. 179.

¶ Hennen, in Obs. on Mil. Surgery, p. 405.



the lung, though no adhesions existed, (a fact now fully established,) is it not reasonable to suppose, that, unless other causes be concerned, a wound of precisely the same nature can never have such a consequence?

*Emphysema* is a diffusion of air in the cellular substance, and may occur in wounds which just enter the cavity of the chest; in others that extend more deeply, so as to wound the lungs; and in cases in which these organs are wounded by the spiculæ of a broken rib, or clavicle. I believe emphysema is never very extensive, when the air vesicles of the lungs are uninjured, and there is an outer wound, through which the air can freely escape. The worst cases are a more frequent complication of fractured ribs, and narrow stabs, than of large penetrating wounds.

When the chest expands, in inspiration, some of the air, which enters through the trachea into the wounded lung, instead of distending this organ, now passes through the breach in it into the space between the pleura pulmonalis and pleura costalis. In the living body, the whole of the inspired air will not be thus effused; but as it must pass through the lung, it will at first distend it, more or less, according to the size of the opening in the pleura pulmonalis; and such partial dilatation of the wounded lung will always happen while air continues to be inspired on that side.\*

When the thorax is next diminished in expiration, the effused air is compressed against the wounded lung; but none of it can enter this viscus again, because the whole of the air, contained in the lung, must be forced out, and what is effused makes equal pressure on every part of the organ, as this becomes collapsed, so that it cannot separate any particular part, and make a passage for itself towards the trachea.

In this manner, fresh air accumulates in the space between the pleuræ at every inspiration, while none can escape during expiration; and thus suffocation may, at last, be produced by the pressure of the collected air on the diaphragm, mediastinum, and opposite lung.

When emphysema happens to be a complication of narrow stabs, or of fractures of the ribs, attended with injury of the lungs, the pleura costalis and intercostal muscles are at the same time wounded or lacerated, so that part of the air also usually gets through the wounded membrane into the cellular substance on the outside of the chest, and thence is sometimes diffused, through the same substance, over the whole body, so as sometimes to inflate it in an extraordinary degree. The inflation of the cellular substance has been considered the most

\* See Halliday's Obs. on Emphysema, 1807.

dangerous part of the disease; but Mr. Hewson\* most ably proved, that this supposition was erroneous. The wound of the pleura and intercostal muscles may sometimes be too small to suffer the air to pass readily into the cellular membrane, and may confine a part of it in the cavity of the thorax, in which circumstance, it will compress the lungs, and cause the same symptoms of tightness of the chest. quick breathing, and sense of suffocation, which water does in *hydrops pectoris*, or matter in *empyema*.

The air, however, in general, makes a way for itself through the cellular membrane; and as the passage of air into the cavity of the thorax, through the breach in the lung, during inspiration, is more easy than the return of that which has been already effused into the cellular membrane, this effusion continues to go on with great rapidity, and is increased by every expiration.

The degree, in which the inflation of the cellular membrane sometimes happens, may be judged of by the case related by Littre;† where the swelling on the chest was eleven inches thick; nine on the abdomen; and four on all other parts of the body, except the scalp, palms of the hands, and soles of the feet.

In cases of *emphysema*, the danger does not depend so much on the extent of the internal swelling, as on the degree of compression produced on the mediastinum, diaphragm, and the lung of the opposite side, combined with inflammation and extravasation in the chest.

If air should not diffuse itself before the third or fourth day from the accident, there is not much chance of its doing so afterwards, because the cellular membrane is soon closed with coagulating lymph.

In cases of *emphysema*, Mr. Abernethy recommends the application of a bandage round the chest, whether the lung be collapsed or not; and he considers the plan especially useful, when any of the ribs are broken.‡ There can be no doubt, that a bandage must tend both to prevent the increase of the *emphysema*, and the pain which the motion of the unsupported fractured ribs would otherwise cause. But the external crackling tumour has never seemed to me a serious occurrence of itself, and its extension can always be stopped by making a few punctures, or scarifications. Some cases which have fallen under my observation, incline me to doubt, whether bandages are ever proper, as long as air is passing from a wound of the

\* *Med. Obs. and Inquiries*, vol. iii.

† *Mém. de l'Acad. Royale des Sciences*, pour 1713.

‡ *Surgical Works*, vol. ii. p. 183.

lung into the bag of the pleura. They hinder the egress of air from the chest through the breach in the pleura costalis, and by so doing, they must have the effect of augmenting the quantity of that air which is confined within the chest, and of producing a dangerous pressure on the mediastinum, diaphragm, and opposite lung. If the bandage be employed with the view of indirectly stopping the continual passage of air out of the wound in the lung itself, and of expediting its healing, I do not know that the practice is really necessary; because, if the patient live a few days, the adhesive inflammation invariably shuts up the injured air-cells, and the further escape of air is then effectually prevented. These sentiments are offered, with diffidence, both because several points, relative to the state of the lungs in emphysema, have not hitherto been satisfactorily explained, and because the employment of bandages in these cases is sanctioned by high authorities.

When the emphysema is large, it is highly proper to give an outlet to the air, by making small punctures in various situations, and promoting its exit by frictions. Indeed, the surgeon is always to be content with this practice, unless the symptoms of compression on the diaphragm and opposite lung, and the approach of suffocation, denote that the air cannot get out of the cavity of the pleura so quickly as it finds its way into it; in which case, a small, but direct, opening, is to be made into that side of the chest, on which the wound is situated.

The practice of endeavouring to exhaust the air from the chest with syringes, is now universally rejected, because the air is soon absorbed; and the use and possibility of making the collapsed lung expand in this sudden way, are not credited by the best practitioners. The objection to immediately closing a wound, practised to remove the pressure of the air off the diaphragm and opposite lung, is, that this pressure may possibly recur, in consequence of the air collecting again. Yet I am by no means certain, that the chance of a relapse is such as to justify the plan of keeping a short cannula in the wound, for about forty-eight hours. The most experienced surgeons, I believe, do not find this proceeding necessary. When the wounded lung collapses, and remains quietly in this state, its condition is the most favourable for the healing of the breach in it; and if a small direct opening has been practised, the air will rarely accumulate in such quantity again in the chest, as to make dangerous pressure on the diaphragm, mediastinum, and opposite lung; and this latter will be enabled to do its functions, so as to support life, till the wounded lung is healed.

The wound, however, never requires to be kept open longer than two days; because at the end of this time, the wound in

the lung is always closed with coagulating lymph, and no more air can escape.

Unfortunately, in these cases, the danger is frequently owing to other causes, besides the pressure of air on the lungs, diaphragm, &c.: the interlobular cellular substance of the lungs may become inflated, together with the rest of the common cellular membrane, and thus compress the air-cells in a degree that may produce suffocation. Emphysema, and the pressure of the confined air on the lungs, may be accompanied with a copious extravasation of blood in the chest. Lastly, besides these sources of danger, another considerable one is the tendency of the lungs and pleura to such inflammation, as will of itself destroy the patient, unless counteracted by active anti-phlogistic treatment.

#### WOUNDS OF THE LUNGS, &c.

In wounds of the chest, it is often difficult to pronounce with certainty, whether they penetrate into the sac of the pleura: but all doubts, with regard to this point, are removed, as soon as air is found to issue from the wound when the patient coughs. That the lungs are wounded may be inferred with nearly equal correctness in every case, in which a person coughs up blood immediately, or soon after being wounded in the chest.

It rarely happens, that a weapon enters the cavity of the thorax, without producing more or less injury of the lungs, and the danger of the latter accident is in proportion to its depth, its situation, and the size of the weapon. A wound of the lungs with a small sword, seldom gives rise to much effusion of blood in the chest, unless the large vessels near the roots of those organs, happen to be hurt. Putting this circumstance out of present consideration, the usual symptoms, which the patient suffers, are a spitting of blood, cough, and difficulty of breathing, succeeded by a good deal of symptomatic fever. "To discover whether the wound has injured the lungs, or not, (says a modern writer,) is a point, which has given to the older surgeons great room for the employment of their ingenuity in devising possible cases, and has occasioned no small waste of time and wax-tapers in ascertaining the exit of air through the passage. A practical surgeon will require but little investigation: bloody expectoration *immediately* on receiving the wound, and the terrible symptoms of dyspnœa, sense of stricture and suffocation, insupportable anxiety and faintness, which succeed, soon enough discover the fact." The immediate danger is either from the quantity of blood withdrawn from the circulation by inward hemorrhage, or from the passage of the blood into the air-cells and cavity of the thorax, so as to cause suffocation. Emphysema may also cause more or less suffering and danger.



The symptoms here enumerated, whether single or in combination, may be deemed the primary effects of wounds of the lungs. Violent inflammatory affections of these organs and of the pleura, subject to relapse; long and tedious suppurations, and exfoliations of bones are the secondary; and, though not so rapidly fatal, are often as certainly so as the others. Diseases also may follow, which, although we cannot strictly call them pulmonary consumption, agree with it in many points, particularly in cough, emaciation, debility, and hectic.\*

When the weapon is broad, and it has entered the substance of the lung, the hemorrhage is considerable; blood is immediately extravasated in the cavity of the thorax, and also flows out of the external wound; the patient has a violent paroxysm of coughing, in which some of the blood is ejected from the mouth; the air comes out of the chest with a hissing noise; and, if the outer wound be not parallel to that of the lungs, emphysema takes place. As I have already stated, the danger of such an injury depends upon the depth of the wound, and the size of the vessels which are opened. Some patients recover; while others die instantly, or in a very short space of time.

As an interesting author remarks, it is a thing really wonderful, "that the thorax, containing the heart, lungs, and great vessels, should be so often wounded with so little danger. Many, no doubt, die; but numbers escape; for a wound of the substance of the lungs is far from being mortal. The blood may suffocate the patient; the fever and pain may waste him; he may die of the inflammation, or of the oppression of the lungs; or there may be time for a large suppuration, or a lingering hectic, to cut him off; but still if his wound be only in the edge of the lungs, he is in some degree safe. He is only in danger when the thick substance of the lungs is perforated, and falls into abscess; or when the root of the lungs is wounded; for, there, the large vessels of the lungs being opened, the great effusion of blood, like that from a wound of the heart itself, must kill, even by the quantity of blood lost to the general system. But besides, this blood being thrown into the trachea, deluges the lungs, the patient spits up a frothy blood; and blood, instead of air, occupies the bronchiæ; so that he struggles for breath but a few moments, and then expires."†

From the previous observations it appears, that the patient may die instantaneously of internal hemorrhage, or may be cut off by the effects of inflammation within the cavity of the thorax, or by the impediment to respiration occasioned by air confined in the same cavity. If (says Mr. John Bell) the patient

\* See Hennen's Obs. on Mil. Surgery, p. 395.

† Discourses on the Nature and Cure of Wounds, p. 257. edit. 3.

be spitting blood, and the breathing be high, but not much oppressed, or the oppression increase but slowly, there are hopes that he may be saved. If there be no great vessel wounded in the lungs, so as to suffocate him at once, it is probable, that the smaller vessels which are opened will gradually cease to bleed; and, after four or five days of alarming cough, with bloody expectoration, this symptom will cease; and, in order that the patient may be the sooner extricated from this danger, *he must be very freely bled. Let it be the intention to reduce him very low by quick bleedings; and let these bleedings have the effect of continued internal hemorrhage, without the dangers of it.* Let them depress him to the same low condition to which the inward bleeding would most likely have brought him; and the system being emptied in this direction, there will be less danger of immediate suffocation in the lungs, and but little fear of the succeeding inflammation of those organs attaining a fatal degree. *If the surgeon bleed only when the cough and bleeding from the lungs return, he can never do wrong.*

In all cases of penetrating wounds of the chest, and especially in injuries of the lungs, the free use of the lancet is the only thing which can be depended upon in the early part of the treatment. By it, internal hemorrhage is restrained; and by it, the dangers of the subsequent inflammation of the thoracic viscera are to be averted. The records of surgery furnish abundant proof of the necessity of such practice. The extent, indeed, to which the bleeding must sometimes be carried, is truly surprising. Le Dran bled one man fifteen times, whom he cured of a wound of the lungs; and in a similar case, Schmucker bled a patient four times a day for eight days in succession.\* And in another instance, where a musket ball had entered the left shoulder, passed through the lungs, and came out below the left nipple, and where a profuse arterial hemorrhage took place from the mouth, threatening immediate suffocation, the bleeding was checked by repeated venesections, which were so freely practised, that two hundred and fifty ounces of blood were drawn off by the lancet in eighteen days.† In every penetrating wound of the chest, and more particularly when the lungs are injured, the first bleeding should be copious. If the patient should faint, we ought not to administer cordials, but allow him to revive gradually. We should avail ourselves of this opportunity to extract, without pain, all foreign bodies within reach, whether cloth, ball, iron, wood, or splinters of bone. Should there be reason for believing, that extraneous

\* Richter's Anfangsgr. der Wundarzn. b. iv. p. 327.

† Thomson's Reports of Observations made in the Military Hospitals in Belgium, p. 86.

substances are lodged, and that by an enlargement of the wound, they might be extracted, the practice ought to be immediately adopted. The next object is to dress the wound. If it be a gun-shot wound, a light mild dressing will be sufficient; but if an incised one, the lips of it should be closed at once. The patient is now to be left to repose, and he will often lie for some hours in a state of comparative ease, till the vessels again pour forth their contents, induce fresh spitting of bloody froth, and a repetition of all the symptoms of approaching suffocation. In this circumstance, the lancet must be used again without hesitation. When the paroxysms of pain, the sense of suffocation, and hemorrhage, have abated, or recur at longer intervals, if the cough be very severe, we may try digitalis, with opiates. The lowest diet is to be prescribed. Mild saline purges and an emollient enema are to be occasionally administered, if required, and the patient kept cool, and away from every thing which is likely to disturb him. Should we be fortunate enough to preserve our patient during the first six or seven days, a relaxation from this rigour may be cautiously admitted; but, as Dr. Hennen observes, a departure from the general plan, or an omission of bleeding on the rising of the symptoms, can only tend to accelerate the event that our efforts are designed to counteract.\* When much cough and pain in the breast continue after bleeding has been fully practised, the application of blisters to the chest is a plan of the highest utility. Frequently leeches, or cupping, will also still be necessary. In some examples, the inflammation terminates in suppuration within the lungs, or sac of the pleura, the symptoms and treatment of which cases belong to the subject of empyema.

One circumstance sometimes deceives the surgeon, and makes him suppose the case to be a penetrating wound of the chest, when it is not so: a musket-ball occasionally pierces the skin and muscles on the outside of the chest, runs round the ribs, and makes its exit nearly opposite the point of entrance. Here the absence of bloody expectoration, and of other symptoms of injured lungs, together with the direction of the track of the ball, will convey useful information.

There is also another source of deception, as to the actual penetration of balls into the cavities of the body: this is when they strike against a handkerchief, linen, cloth, &c. a fold of which is carried by them into the wound, and, when incautiously withdrawn, the bullet is not perceived. Larrey, Hennen, and other writers, relate several instances of this nature.

Wounds of the chest are sometimes complicated with the

\* Obs. on Mil. Surgery, p. 400.

lodgment of extraneous substances in that cavity, and this sometimes without occasioning fatal consequences, either immediately, or subsequently. Thus, Dr. Hennen, in examining the bodies of soldiers who had died of such injuries, frequently found pieces of wadding, of clothes, spiculæ of bone, and balls, and in one case, some charpie, used as a dressing, either loose in various parts of the lungs, or lying in sacs, formed by a deposition of coagulating lymph. In some more fortunate patients, who recovered, the extraneous substances were discharged, or extracted from the wound; while in other lucky examples, they were ejected by the convulsive efforts to cough, which their irritation had excited.\* The same author relates the following case, to prove that a much larger mass than a bullet, may pass even through the lungs, without doing away all chance of recovery. A soldier was wounded through the thorax, between the third and fourth ribs of the right side. The wound was large enough to admit three fingers conically placed; and blood and air were freely discharged from it. On turning the man at the time of changing the dressings, a tumour was discovered on the scapula, from which was extracted his breast-plate, about two-thirds of which were rolled up by the force of the blow into a figure somewhat resembling a candle-extinguisher, with the musket-bullet contained within it. The other third was broken off; but it also had passed through the wound, and was extracted. The man survived the injury three weeks, and at one period afforded great hopes of recovery. The circumstance, however, of nothing particular happening in this case for the first five days, must raise doubts, whether the breast-plate and bullet actually went through the lungs; a conclusion, which should hardly have been made without an examination of the state of those viscera after death.

There is less difficulty, however, in understanding how a bullet may lodge many years in the substance of the lungs, without producing inconvenience enough to indicate even its situation. We know, that, after the first dangers of such injuries are over, the balls are included in a kind of cyst, formed round them by the adhesive inflammation, and may occasion little or no disturbance in the functions, or sensations of the part. Some curious instances are also recorded, in which loose balls have rolled about in the cavity of the thorax at every motion of the patient.†

When a penetrating wound of the chest is of a certain size, a protrusion or hernia of the lung may happen. If the exposed

\* Op. cit. p. 390.

† See Percy's *Manuel du Chirurgien d'Armée*, p. 95; *Magatus's Bibliotheca Chirurgica*; *Hennen's Mil. Surgery*, &c.



part of the lung should not be in a bleeding state, the most rational practice must be that of returning it as speedily as possible, into the cavity of the chest again; and if necessary, even to enlarge the wound for the accomplishment of this object. Several cases are recorded, however, in which the projecting piece of the lung was either removed with a knife, or ligature, and the patients recovered.\* The projecting portion of the lung often has a livid appearance, occasioned by exposure of the part to the air, and its strangulation between the ribs. But, this affords no proof, either that the protruded part is gangrenous, or that it ought to be removed.† Loyseau, when he had cut off a piece of lung, which he supposed gangrenous from its appearance, put it in water, and was surprised to find it immediately resume its natural colour. Even were the part really in a mortified state, the safer practice must undoubtedly be that of allowing a natural separation of the slough to take place.

#### EXTRAVASATION OF BLOOD IN THE THORAX.

The diagnosis of this case is by no means free from obscurity. The following, however, is said to be the ordinary character of the symptoms. In most instances, a wound of the lungs being the source of the hemorrhage, this occurrence will be indicated by the issue of frothy blood and air from the external wound, and by the patient's coughing up blood in large quantities. If, however, the bleeding be from an intercostal artery, the internal mammary, or other sources, no blood will be coughed up. Directly after the receipt of the injury, the patient generally falls into a state of syncope; and though the bleeding may not be very considerable, he is affected with cold sweats, and his pulse is feeble and small. Notwithstanding copious and repeated venesections, practised after his revival, respiration becomes short, difficult, and laborious; and inspiration is said to be more easily performed than expiration. The patient usually lies upon the side on which the extravasation is situated; and this side seems rather larger and broader, at its lower part, than the opposite corresponding part of the chest, on which the patient cannot lie, without an aggravation of all his sufferings. When he tries to sit up in bed, he cannot remain in this position, unless he bend his body very much forwards, in order to facilitate respiration. He feels a sense of great heaviness about the ensiform cartilage, and diaphragm, attended with a frequent cough,

\* Fabricius Hildanus, *Centur. 2. Obs. 32. p. 108*; Loyseau, *Obs. Medicales et Chirurg. p. 25*; Ruysch, *Obs. Anat. Chir. Obs. 53*. In a soldier wounded at Waterloo, the great length of a piece of protruded lung, and the manner in which it was lacerated and injured, induced me to follow this method; but the patient did not ultimately recover.

† Lassus, *Pathologie Chir. t. ii. p. 309*.

and a most oppressive sensation of suffocation. According to Valentin, sometimes in an advanced stage of the case, a large ecchymosis, or violet-coloured spot, makes its appearance about the angles of the ribs; but this symptom is far from being either constant, or restricted to the cases before us; nor did it occur in the instance of extravasation of blood in the thorax, recorded by Dr. Thomson.\* In general, blood escapes from the external wound, unless the opening be very small, or situated in the upper part of the chest. Lastly, it is remarked, that the oppression of breathing from inflammation of the lungs usually subsides, or is lessened by venesection, which is not the case when it depends upon extravasation.

If it be true, that in some patients the breathing has been very little oppressed, notwithstanding an extravasation of blood in one of the cavities of the pleura, and that others have been able to lie with equal ease, either upon the sound or diseased side,† which is not common, we must conclude from these anomalous cases, that we ought not to form our opinion from any one symptom in particular, but from the assemblage of a great many.‡

An extravasation of a large quantity of blood in the chest, is unquestionably an urgent case, both because the patient is in danger of immediately dying of the inward hemorrhage, and because he is afflicted with alarming symptoms of suffocation. These latter, it is true, call for paracentesis thoracis, in order that the effused blood may be discharged, and its pressure be removed from the lungs; yet this very proceeding is itself hazardous, as it may renew the internal bleeding, of which the patient may at once perish. Thus the surgeon has before him two dangers, equally great; viz. that of seeing his patient die of suffocation, if the operation be not performed; and that of beholding him fall a victim to hemorrhage, if an opening be made for the evacuation of the blood before the wound in the vessel is closed.

I believe, that, in this difficult part of surgery, they are generally the most prudent practitioners who are not too officious and hasty in taking measures for discharging the blood. Scarpa, Larrey, Assalini, and Hennen, all agree that wounds of the chest should be closed, and lightly and superficially dressed. Scarpa§ in particular insists upon the prudence of omitting no means for effecting the immediate union of a penetrating wound, care being taken to check the force of the circulation

\* Reports of Observations made in the Military Hospitals in Belgium, p. 85.

† See a Case by Thomson, *op. cit.* p. 87.

‡ Lassus, *Pathologie Chir.* t. ii. p. 319.

§ Sull' Ernie *Memorie Anat. Chir. Mem.* 4.

by repeated bleedings, and every antiphlogistic remedy, in order to prevent or diminish internal hemorrhage as much as possible. If, says he, notwithstanding such treatment, blood should be extravasated between the pleura and lungs, it would press equally upon every point of those viscera, and contribute to stop the bleeding. When the wound in the lungs is healed, and the extravasated blood is not in too large a quantity, it will be gradually removed by the absorbents. In the contrary case, it will form a swelling beneath the cicatrix, and present itself externally;\* or, then, if necessary, a counter-opening may be made.

If, after a time, the presence of the blood should be followed by suppuration in the cavity of the thorax, the urgency of the symptoms, arising from this new state of the case, must then determine the propriety of the operation. The danger of renewing the bleeding is now past, and no longer a consideration in the mode of treatment.

When the propriety of discharging a collection of blood in the chest has been determined upon, several modes of fulfilling this indication have been suggested. 1. Placing the patient in a posture favourable to the escape of blood from the wound. 2. Drawing out the blood with a syringe or tube. 3. Enlarging the wound. 4. Making an opening at a depending part of the chest.

1. It is only when the wound is large, and direct in its course, and the blood in a fluid state, that mere posture will answer.

2. Syringes, or tubes, are likely to do more harm by their irritation, than good by facilitating the discharge of the blood; when this is fluid, it will escape spontaneously, if the opening be depending; and when coagulated, it cannot be drawn out with such instruments.

3. The enlargement of the wound will only be useful, when its situation is favourable for the escape of the blood.

4. When the blood is coagulated, the injection of tepid water is sometimes recommended, especially by French surgeons, who direct the practice to be repeated every day, till the fluid returns untinged with red globules, and quite free from coagula. On the utility of this proceeding, I can offer no decided opinion, because I have never seen any case, which seemed to require it; but I have no hesitation in expressing a strong suspicion, that whatever may be the propriety of throwing fluid into the chest, there never can be any good sense or reason in keeping the external wound open for the performance of the experiment.

\* *Petit sur les Maladies observées à l'Hôtel Dieu de Lyon*, p. 299.

5. When the wound is narrow, and situated either at a fleshy part of the chest, or at its upper part, a counter-opening should be made in a depending situation, and in the manner described in the next chapter.

## CHAPTER XXXI.

### PARACENTESIS OF THE CHEST.

THIS operation consists in making an opening into the cavity of the chest, for the purpose of giving vent to air, water, matter, or blood, by the pressure of which the functions of the lungs are dangerously obstructed.

The surgeon can hardly ever know with certainty, that a fluid is contained in the chest, so equivocal are the ordinary symptoms. If there were not this cogent reason, still the idea of performing the present operation with such an instrument as a trocar, is deserving of the strongest reprobation. The proper instrument is a small bistoury; and the operation, when cautiously and skilfully executed, is not likely in itself to prove dangerous. Hence, though in most of the cases, in which we are called upon to perform paracentesis, there may generally be considerable doubt about the presence of a fluid in the chest, yet, if symptoms are urgent, we should not be afraid of practising a small opening, as the very failure will be itself a source of useful intelligence.

When the cavity of the chest is filled with water, the disease is termed *hydrops pectoris*; when with pus, *empyema*, a word implying internal suppuration. Both water and pus, extravasated in the chest, have some symptoms common to them; such as short and difficult respiration, the lungs of the affected side being compressed by the collection of surrounding fluid. In both cases, also, expiration is even more difficult than inspiration, on account of the weight of the fluid, which strongly opposes the elevation of the diaphragm. Sometimes, when the patient moves in bed, he distinctly feels the undulation. If the fluid be contained in only one cavity of the chest, he cannot lie comfortably on the opposite side, because the fluid compresses the other lung. The ribs on the affected side are more arched than is natural, because the fluid resists their depression. When no symptoms of suppuration have occurred, the case may be deemed *hydrops pectoris*. The face, the integuments



of the chest, and lower extremities, are frequently œdematous, and sometimes also the arm on the side affected, especially when the quantity of fluid is copious. Sometimes dropsy of the chest is joined with the same general affection of the whole body. All these symptoms, however, may indicate empyema, when combined with preceding marks of inflammation and suppuration in the chest. When symptoms of acute peripneumony have taken place; and when rigours have occurred at the termination of the inflammatory fever, just before the commencement of the above kind of symptoms; it is rational to infer, that the case is empyema. I remember a man in St. Bartholomew's hospital, whose heart was pushed to the right side of the chest, by an abscess in the left bag of the pleura. The preceding inflammation in the chest, the occurrence of rigours, the great difficulty of breathing, and the palpitation of the heart, quite on the right side of the sternum, made the nature of the case sufficiently evident. When the left cavity of the chest was opened after death, an enormous collection of matter was discovered. In this instance, paracentesis ought undoubtedly to have been performed.

With regard to the most proper place for the opening, a few words are necessary, because some excellent surgeons, among whom is Bertrandi,\* disregarding every other consideration, but that of making a depending aperture, advise us to perform the operation between the third and fourth false ribs, counting from the last, and about four or five finger-breadths from the spine. But every object can be effectually obtained by making an opening more forward, where there are no muscles, except the intercostals, to be divided. The most eligible place, is between the sixth and seventh true ribs, just at that point, where the indigitations of the serratus major anticus terminate. By placing the patient on his abdomen, this opening may be rendered very depending.

An incision, about two inches long, must be made through the integuments, which are first to be drawn to one side, if it be intended to close the wound immediately after the operation. The intercostal muscles are next to be cautiously divided, and as soon as the pleura costalis is exposed, a small puncture carefully made in it. The intercostal muscles must be divided closely to the upper edge of the lower rib, in order to avoid all risk of wounding the intercostal artery, which runs in a groove along the lower edge of the upper rib.

In emphysema, a small puncture will suffice; in hydrops pectoris it may be somewhat larger; and, in empyema, the mat-

\* *Traité des Opérations de Chirurgie*, pp. 253, 254. edit. 1784.

ter must have an opening of sufficient size to allow the fluid to escape freely, and a short cannula to be introduced.\*

The only circumstance, in which the opening should be made elsewhere, is when the fluid happens to be prominent at some other point of the chest.

## CHAPTER XXXII.

### REMOVAL OF A DISEASED BREAST, AND TUMOURS IN GENERAL.

THE manner of removing encysted tumours has been already described.

When the breast is affected with any disease of an incurable nature, the whole of the diseased parts may sometimes be removed with a knife, the wound healed, and the patient's life prolonged, or freed from great suffering and annoyance. The circumstances under which the operation should be undertaken, are noticed in the chapter on cancer.

If the disease be of a scirrhus or malignant nature, some particularity in the mode of operating is requisite. In this case, the surgeon, instead of merely removing parts which are palpably and visibly diseased, should make it a rule to take away a certain quantity of the substance in the immediate circumference of the disease. Every experienced man is fully aware of the great propensity of the skin to be affected, and the frequent extension of white morbid bands into the surrounding adipose membrane. These facts clearly show the propriety of making a free removal of the skin, whenever it is in the least discoloured, puckered, adherent to the swelling, or in any way altered, and of taking away a good deal of the fat, in which scirrhus tumours are sometimes involved. On the contrary, if the disease be a mere sarcomatous enlargement, the removal of the skin is not necessary on this principle, though it may be so on another, viz. the superfluous quantity of it, when the tumour is very large. When cancer recurs, the skin is the first part in which it usually makes its appearance, and the skin of the nipple in particular. Hence many surgeons always make it a rule to remove the latter part, when it is judged proper to take away

\* See Hey's Practical Obs. in Surgery, p. 497. edit. 2.

any of the integuments. As Sir Astley Cooper has observed, it is not sufficient to remove the tumour, but the gland, from the nipple to the tumour, must be removed, and the surrounding parts, to some extent, taken away.\*

The patient is usually operated upon in the sitting posture; but, the recumbent has advantages, particularly when any gland in the axilla is to be taken away, or, the patient is likely to faint. If the sitting posture be chosen, the pectoral muscle is frequently made tense by keeping the arm back with a strong stick, placed transversely behind the back, in front of the arm; but, as this method is rather alarming to females, it is better to let an assistant take hold of the arm above the elbow, raise it from the side, and incline it backward, so as to put the great pectoral muscle on the stretch.

When the case is not of a malignant character, and no part of the integuments is to be removed, a straight incision may be made through them; the tumour is to be regularly dissected on every side from the circumjacent parts; and lastly, its base is to be detached, from above downward, till the whole is separated.

If the outer incision has been made transversely, the lower half of the swelling should be separated from its surrounding connexions, before the dissection of the upper portion is begun, by which means, the surgeon will not be incommoded by the blood falling into the lower part of the wound, before the detachment of the adjacent portion of the tumour is effected. As soon as the lower half of the swelling is separated from its connexions, the surgeon is to undertake the dissection of the upper half.

Such are the modes of removing all simple tumours, which are not of a malignant nature, nor of immense size.

When the tumour is malignant, and adherent to the skin and pectoral muscle, the operator is to remove, at least, an inch or two of the fat on every side of the disease. The portion of the skin, intended to be taken away, must be included in two semicircular incisions; which meet thus ( ) at their extremities; and when the base of the tumour is to be detached, the surface of the pectoral muscles, wherever it is adherent to the tumour, is also to be removed. The advantage of making the incision, in the preceding manner, obviously consists in enabling the surgeon to bring the edges of the wound together after the operation, so as to form a straight line, and admit of union by the first intention.

The mere magnitude of a tumour frequently renders it highly judicious to take away a portion of the skin: if some were not

\* Lectures, vol. ii. p. 199.

removed, the dissection would be tedious; and, after the operation, the loose skin would lie in folds, and form, as it were, a large pouch for the lodgment of matter.

In the extirpation of a diseased breast, the direction of the external incision must, in some measure, be determined by the shape of the tumour; but, according to Desault, there are advantages in cutting as much as possible transversely, when circumstances will allow. It is alleged, that, as the integuments are more yielding upwards or downwards, than they are in a cross direction, especially near the sternum, the transverse wound may be more expeditiously united; and that, as the great pectoral muscle only acts perpendicularly, with respect to the edges of the incision, it cannot tend to separate them. Desault thought these advantages of higher importance, than that of the easy escape of the matter at the depending angle of the wound; the reason generally assigned for the perpendicular direction of the incision, commonly preferred. In this country, the direction of the wound is often made obliquely downwards and forwards, and the base of the tumour cut from the pectoral muscle in a similar direction, the detachment being first accomplished at the upper and outer part of the wound, and then regularly extended to its lower and anterior end.

The tumour being removed, the surgeon should examine the interior of the wound, in order to ascertain, that no indurated part is left behind; and if any hardness be detected, it ought to be removed. He should also examine the surface of every scirrhus tumour, immediately it is taken out, and see whether any of the white bands, shooting into the surrounding fat, have been divided; for, in this case, some portions of those bands must have been left behind, and ought to be taken away. Their situation may be known, by considering the position of the tumour before the operation.

When the dissection will occupy a considerable time, every large artery should be tied as soon as it is divided. This remark is not meant to comprehend vessels of such a diameter, that, though they bleed when first cut, they do not long continue to do so, and therefore require no ligature.

When a tumour of the breast has been entirely detached, and the large bleeding vessels tied, the arm is to be brought forward. Then, if there be any diseased gland in the axilla, the patient should lie down on the opposite side, and the arm be raised, so that the arm-pit may be completely exposed to the light. The first wound should then be enlarged in the direction leading to the gland, which is to be taken hold of with a double tenaculum, as soon as the skin over it has been divided, and being well raised up, it is to be cut away, together with the cellular membrane, in the line between it and the diseased



breast.\* I have seen some distinguished operators content themselves with lifting up the diseased gland on a tenaculum, separate it from its lateral connexions, and then tie its base with a ligature. This method was preferred to its complete excision, on account of the frequent difficulty in securing the short artery, which enters the gland, almost immediately it has quitted one of the thoracic arteries.

The operation being finished, the skin of the breast is to be relaxed, and the edges of the wound brought together with adhesive plaster, supported with a compress and bandage. I have never seen any real occasion for a suture, which is sometimes employed. The arm, on the same side, should always be kept quiet in a sling, until the wound is healed.†

## CHAPTER XXXIII.

### WOUNDS OF THE BELLY,

ARE divided into two principal classes: in one, the solution of continuity is confined to the integuments, muscles, &c. exterior to the peritoneum: in the other, this membrane is penetrated, and frequently some of the viscera. Wounds, which do

\* See Sir A. Cooper's Lectures, vol. ii. p. 200.

† { In removing tumours in general, particular attention should be paid to making the incisions through the skin of such an extent, that the operator shall not be embarrassed in the subsequent step for want of room, and be forced afterwards to enlarge the incisions, and prolong the patient's suffering from the unnecessary delay.—In separating the lower half of the tumour from its connexions, the operation will be accelerated by detaching it at the angles of the incisions, before commencing to separate it above, nor will it be necessary, unless there be adhesions to the subjacent muscles, or other particular parts, to continue the dissection under the basis of the tumour; the plan advised by Mr. Allan Burns in such cases, of tearing it or raising it with the fingers from its bed, is to be preferred on several accounts; and in particular, as most of the arteries nourishing these tumours, enter them at their basis, they are torn across, and the hemorrhage in a great measure prevented. Where tumours have formed in the axilla, requiring to be removed with the diseased breast, most surgeons, at present, prefer, to leave the connexions between the breast and glands undivided, until the latter have been fairly exposed and detached in the dissection, by tearing out these glands, or breaking their connexions by the handle of the scalpel. We may, in general, prevent hemorrhage from the vessels, and obviate the necessity of leaving a number of ligatures in the upper part of the wound, which would be required were the vessels cut across with the knife. }

not extend through the peritoneum, are not materially different from those of ordinary textures, and are to be treated on principles applicable to wounds in general. However, if the injury penetrate more deeply than the integuments, the parietes of the abdomen generally remain weakened at the part, and, firm as the cicatrix may appear, if it be not supported with a bandage, it is liable to become the seat of a hernial protrusion.\* Severe contusions of the skin and muscles of the belly, are also sometimes followed by such an incapacity of resistance in them, that they yield to the pressure of the contained parts, and a particular kind of hernial tumour is the consequence.

A spent ball, striking the belly, may rupture the rectus muscle and aponeurosis of the abdominal muscles, so as to produce at once a protrusion of the viscera, while the integuments, on account of their greater elasticity, continue unbroken.† In other examples, the ball, in its rotation over the circumference of the abdomen, not coming against any hard projecting part, even depresses the parietes of the belly, and produces deeper mischief amongst the viscera, succeeded by inflammation, a copious effusion of bloody serum, in the cavity of the peritoneum, and other fatal effects.‡ In a case that had a favourable issue, a cannon ball carried away the integuments, a piece of the left os ilium, and the attachments of the broad muscles of the belly, exposing a part of the sigmoid flexure of the colon.§

Sometimes, in consequence of punctured wounds, or violent blows, matter forms in the tendinous sheath of the rectus muscle, and when the abscess bursts, or is opened, several pints of pus are unexpectedly discharged. The nature of this case should be remembered, as there is frequently no change of appearance in the integuments, denoting either the suppuration or its extent. Such an abscess ought always to be opened early, and in a depending situation. The same practice is advisable, when purulent matter collects between the layers of abdominal muscles, or between these muscles and the peritoneum.

Except when a wound of the belly is large and direct, attended with protrusion of the bowels, or the escape of feces, chyle, fetid air, bile, &c. the fact of its having penetrated the

\* See Richerand's *Nosographie Chirurgicale*, tom. iii. p. 322. edit. 2. Schmucker relates a case, which followed puncturing an abscess of the abdomen with a lancet, *Vermischte Chirurgische Schriften*, band. i. p. 197. See also a case by Wardrop, in A. Cooper's work on *Cruel and Umbilical Hernia*, p. 60.

† Larrey, *Mem. de Chir. Mil.* t. iii. p. 332.

‡ *Op. et vol. cit.* p. 334. See in Hennen's *Mil. Surgery*, p. 452, a Case, in which nearly all the anterior parietes of the belly were torn away, leaving the lacerated peritonium exposed. The injury was not immediately fatal.

§ P. 340.

cavity of the abdomen is generally somewhat obscure. Authors do, indeed, advise us to compare the direction of the stab with the ordinary thickness of the abdominal parietes at the wounded part, and the breadth of the wound with that of the weapon, with which the injury has been inflicted. When the instrument has entered perpendicularly at a place where the parietes are thin, and when, notwithstanding the narrowness of the end of the weapon, the division is rather broad, it is inferred that the wound is of the penetrating kind. This mode of judging, however, must generally be fallacious, on account of the frequent impossibility of learning the exact direction of the thrust, or of obtaining a sight of the instrument. Also, when a probe will pass perpendicularly into the wound for a certain distance, it is concluded, that the injury extends into the abdominal cavity. But it must not be positively inferred, that the wound does not penetrate because a probe cannot be thus introduced; for its passage may be stopped by several layers of muscles, not having exactly the same situation with respect to each other, which they had at the moment of the injury. In short, unless the wound be straight, a probe can hardly be made to follow its course. I shall not dwell on the ridiculous suggestion to employ an injection, as a means of ascertaining whether the wound extends into the abdomen. Were the track of the injury rendered impervious by coagulated blood, an alteration in the relative position of the muscular layers, or other causes, the fluid could not pass into that cavity, even though the wound penetrated. There would also be a great chance of deception; for the liquid might be thrown into the cellular membrane, and seem as if it had entered the belly, when not a drop had passed in that direction. But were the inefficiency of this plan not enough to insure its rejection, its impropriety would prohibit its adoption by every practitioner of common sense. The local symptoms, then, of a simple penetrating wound, are not to be depended upon, and the employment of probes and injections for ascertaining the point, is more likely to do serious harm than real good. Nor can certain information always be deduced from a consideration of what may be called the *general* symptoms; a small, feeble, contracted pulse; pallid countenance; cold extremities; great and sudden debility; hiccough; vomiting; and spasms. Several of these effects frequently take place in irritable, timid, nervous subjects, without any parts being injured, in addition to the skin and muscles; and they are frequently absent, when the weapon has actually entered the peritoneum. I am far from meaning to say, however, that such indisposition is to be disregarded; on the contrary, I would have the young surgeon pay particular attention to the symptoms in question, because if they do not soon subside, there are

then strong grounds for suspecting something more, than the effects of a common superficial wound on an irritable, timid subject. But, in the beginning, unless the wound be large, or a protrusion of the viscera, or a discharge of bile, chyle, or feces, take place, there is generally a degree of uncertainty, with respect to the depth of the injury. At the same time, it is not to be concluded, that the wound does not penetrate, because no protrusion, nor extravasation happens; for a narrow stab may extend into the abdomen, even amongst the viscera, without giving rise to either of these accidents.

There is in these cases a class of symptoms, which Richter\* and other writers denominate *particular*, from their evincing what bowels are wounded; as, for instance, bloody urine, when the kidneys and urinary bladder are injured; vomiting of blood, when the stomach is pierced; discharge of blood with the feces, when the large intestines are wounded. Symptoms, like these, must of course throw considerable light on the nature of the accident.

With regard to our not being always able to pronounce, whether a wound penetrates the cavity of the belly or not, the want of precise information on this point is of little practical importance; for, if the case be not complicated with any urgent symptoms, the treatment should obviously resemble that of a simple wound.

Penetrating wounds of the chest give rise to a variety of dangers; sometimes depending upon effusion of blood into the bronchiæ and air-cells of the lungs, or into the cavity of the pleura; sometimes upon the consequences of that extraordinary complication, emphysema; but, more especially, upon the great tendency of the pleura and lungs to inflammation. The principal dangers of penetrating wounds of the belly also partly arise from internal hemorrhage, or extravasation of the contents of the viscera; but, in a still greater degree, from the strong disposition of the peritoneum to inflammation. With the exception of persons who die instantly, or in a few hours, from internal bleeding, &c. nine-tenths of those, who die from penetrating wounds of the belly, are cut off by peritonitis. They who perish with extravasation of the contents of the bowels, also die in fact from peritonitis, which is generally excited partly by the injury, and partly by the irritation of the effused matter. Many authors represent the danger of a penetrating wound of the belly, as principally arising from the entrance of air into the cavity of the peritoneum. But, according to my ideas, it is the wound itself, which excites the peritonitis, by which the patient is destroyed, and the same fatal inflammation

\* Anfangsgr. der Wundarzn. b. v. p. 7.



would probably come on with equal frequency, were the wound entirely excluded from the air. The cavity of the belly is always so completely occupied by the viscera, that the whole inner surface of the peritoneum is constantly in close contact with them, and, therefore, the air cannot so easily enter within that membrane, as some writers seem disposed to believe.

WOUNDS IN WHICH THE VISCERA PROTRUDE, BUT ARE UNINJURED.

When a portion of intestine, or omentum, protrudes, the sooner it is returned, the more effectually will the irritation, arising from its exposure and constriction, be prevented. Fomenting the protruded bowels, as is sometimes recommended, would be absurd; for what application can be so congenial to them as the natural warmth and moisture of that cavity, into which they ought to be immediately reduced? And is it possible to suppose, that the efficacy of any artificial fomentation will make amends for the harm, resulting from continuance of the bowels in a state of exposure and constriction? In order to promote the reduction, the muscles of the abdomen should be relaxed; but, whether we ought to waste any time in giving clysters to empty the large intestines, previously to attempting to return the parts, is a question, on which I entertain nearly the same sentiments as those delivered on the subject of fomentations. The mesentery is always to be returned before the intestine, and the intestine before the omentum; but the last protruded portion of each of these parts ought to be the first reduced. In the reduction, care must be taken, that the bowels are completely returned into the abdomen, and are not pressed between the layers of the abdominal muscles, or into the sheath of the rectus muscle.

When the distention of the protruded intestine with air or feces creates a difficulty of reduction, its contents may frequently be gradually pressed into that portion of the intestinal canal, which is within the abdomen, and the gut may then be returned. But, if this plan were attended with difficulty, I should prefer dilating the wound to much handling of the bowel.

When the protruded bowel is distended with air, Paré and others recommend making small punctures in it with a needle, so that the air may escape, and the intestine collapse. This proposal is justly rejected from modern surgery, both on the grounds of danger and inefficacy. The small apertures, made with a round needle, will not discharge the air; for they are closed by the mucous coat,\* and the making of larger punctures,

\* See Travers on Injuries of Intestines, &c. p. 176.

as suggested by Desault,\* would be far more dangerous than dilating the wound.

When it is absolutely necessary to enlarge the wound, the dilatation should be made in a direction, which will not endanger the epigastric artery; and, if possible, parallel to the muscular fibres.

When the protruded intestine is in a state of inflammation, its immediate reduction is, beyond all dispute, the right practice. Even when the inflammation is severe, the reduction of the part without delay, and the employment of antiphlogistic means, will often prevent gangrene. The dull, brown, dark-red colour of the protruded intestine, may induce the practitioner to suppose, either that it is already gangrenous, or that gangrene is inevitable, and, consequently, he may delay returning it into its natural situation. But, notwithstanding this suspicious colour of the intestine, its firmness will evince, that it is not in the state of gangrene, and, therefore, its immediate reduction ought to be put in practice. The recovery of a portion of intestine, so circumstanced, is always a matter of uncertainty; but the propriety of speedily replacing it in its natural situation is a thing most certain. In case it should mortify, after being reduced, all hopes of the preservation of life are not to be abandoned, as I shall again notice at a proper opportunity.

When the omentum protrudes, and is strangulated by the narrowness of the opening, it soon contracts adhesions. Riche-rand has recommended us to cut off all this membrane, which exceeds the level of the integuments, and not to trouble ourselves about the remainder, which, he asserts, will act like a stopper, and hinder a future hernia. However, notwithstanding such advice, if the wound were quite recent, so that adhesions had not yet formed, the propriety of dilating the opening, and reducing the omentum, would be unquestionable. Many objections, founded on the danger of leaving this part in a state of constriction, might be made to Richerand's proposal; but, in the present state of surgery in this country, it cannot be necessary to enter into them. Whenever the omentum is also sound and free from constriction, it should be reduced. In cases where this membrane, besides protruding, is in a gangrenous state, surgical writers authorize the excision of the dead part, and the reduction of the rest, each of the bleeding vessels having been first tied with a small silk ligature. I apprehend, however, that whenever the omentum has been out so long as to slough, adhesions within the wound must generally have had time to form; an event which would embarrass the operator,

\* *Traité des Maladies Chirurg.* tom. ii. p. 135.

and even prohibit the attempt. The reduction having been effected, the patient is to be laid upon his back, with the thighs bent upon the pelvis, and he must strictly avoid making any exertion, lest he bring on another protrusion. The wound is then to be closed with adhesive plaster, and the uniting bandage; but if the division be extensive, and these means ineffectual, it may be proper to have recourse to a suture. The stitches, however, should always be as few as possible. This method of sewing up wounds of the belly, made a long subject, in all the old works on surgery, under the appellation of *gastroraphe*, which was nothing more than a quill-suture, practised by introducing the needle through both lips of the wound from within outwards, in order to avoid all risk of pricking the bowels. At the present day, we scarcely ever hear of *gastroraphe* being performed. In Pibrac's\* dissertation on the abuse of sutures, cases are related, which satisfactorily prove, that the majority of penetrating wounds of the belly may be healed very well without it; and if we wish for still more decisive proofs of the fact, we may find them in accounts of the Cæsaræan operation, the extensive wound of which has frequently been healed by common means. But though sutures are not usually necessary for wounds of the belly, I will not assert, that they may not be useful under particular circumstances. For instance, were a large wound to be made across the abdomen, a suture might be indispensable to prevent the protrusion, or exposure of the bowels; yet, even in this case, the stitches should be as few as possible.

#### CASES, WITH INJURY AND PROTRUSION OF THE VISCERA.

Penetrating wounds of the abdomen, attended with protrusion of the intestines, or omentum, are always to be regarded as dangerous cases; but the danger is much more serious, when a portion of the intestine not only protrudes, but is also wounded. Under such circumstances, we have the authority of numerous writers on surgery, as a sanction of the practice of sewing together the edges of the wound in the bowel; the true utility of which practice, however, is now a disputed point. Even the advocates of sutures here differ exceedingly, both as to the precise object in view, and the way of making the stitches. Some advise only one stitch to be made (frequently only through the mesentery); and they employ the ligature chiefly with the view of confining the injured bowel near the external wound, so that, in the event of any effusion, the matter may

\* See *Mém. de l'Acad. de Chir.* tom. iii. 4to. Other cases of similar success may be perused in numerous works; *Journal de Médecine*, tom. lxxi.; *Duncan's Medical Commentaries*, vol. x.; *Philosophical Transactions*, vol. xlv. &c.

readily find its way outward. Other writers wish to remove the possibility of extravasation by applying numerous stitches, and attach little importance to the plan of using the ligature principally for the purpose of keeping the intestine near the external wound.

When the wound of a bowel is so small, that it is closed by the protrusion of the villous coat, the application of a suture must evidently be altogether needless. Supposing the breach in the intestine, however, to be somewhat larger, so as to be capable of letting the feces escape, what practice ought we to follow?—As Sir Astley Cooper was operating upon a strangulated hernia, an aperture, giving issue to the intestinal contents, was discovered in a portion of sound bowel, just when the part was about to be reduced. The operator, including the aperture in his forceps, caused a fine silk ligature to be carried beneath the point of the instrument, firmly tied upon the gut, and the ends cut off close to the intestine. The part was then replaced, and the patient recovered. Mr. Travers, who has related this fact, approves of the plan of cutting away the extremities of the ligature, instead of leaving them hanging out of the external wound; for the remnant always finds its way into the intestine, and is discharged by stool, without the slightest inconvenience.\*

We are next to consider the case, in which the protruded bowel is still more extensively, or even totally divided. Here the admirers of the needle have found ample scope for their ingenuity; and since very few of them have met with cases exactly of this description in the human subject, they have made a variety of experiments on animals, in order to determine the right mode of treatment. Some of these reports are favourable to the practice of sewing up the wounded bowel. Ramdohr is stated to have actually cut off a large part of a mortified intestine in the human subject, and to have joined the sound ends together, by inserting the upper within the lower one, and fixing them in this position with a suture; the ligature being also employed to keep them near the external wound. The patient recovered, and the feces afterwards passed entirely the natural way.† About a year after the operation, the patient died, when the anatomical preparation of the parts was sent to Heister. They were preserved in spirit of wine, and exhibited, according to this last author, a union of the two ends of the bowel, and their consolidation with a part of the abdomen. Now, it has been reasonably questioned, whether

\* Inquiry into the Process of Nature in repairing Injuries of the Intestines, &c. pp. 112, 113.

† Haller, Disput. Anat. vol. vi.; Obs. Med. Miscell. 18.



the union here spoken of, ever really happened. When the upper end of the bowel is introduced into the lower, the external surface of the former is put in contact with the inner one of the latter; a serous membrane is placed in contact with a mucous one. These heterogeneous structures, Richerand alleges, are not disposed to unite. The mucous membrane, when inflamed, more readily secretes a kind of mucus, which must be an invincible obstacle to adhesion. He thinks it therefore more than probable, that, in the case related by Heister, the invagination was maintained by the union of the intestine with the corresponding part of the abdominal parietes. Several experiments on living animals have convinced him that this happens, and that the mucous membrane will not unite with the external peritoneal coat. If this be a fact, it is of course a strong argument against repeating Ramdohr's practice. Another objection is, that the upper end of the bowel cannot be put into the lower one, unless it be separated from a part of the mesentery, and a division of the mesenteric arteries would cause a dangerous bleeding. In vain did Boyer tie seven or eight of these vessels; his patient died with an extravasation in the abdomen.\* The difficulties, encountered by Moebius and Dr. Smith, in their attempts to repeat this experiment on animals, are related in my dictionary, and I need not, therefore, expatiate upon them. In short, experience is decidedly adverse to Ramdohr's practice, either in its original form, or modified by the ingenious introduction of cylinders of isinglass, pasteboard, &c. Flajani tried the artifice on several patients under his care, in the hospital at Rome, but death was invariably the consequence.† I am of opinion that Mr. Travers deserves the thanks of the profession, for the attention and talent with which he has investigated the subject before us; but with respect to the question of sutures, I apprehend, that he has gone too far, much too far, when he declares, that, in order to avoid abdominal effusion, the suture employed should be such as will secure the absolute contact of the everted surfaces of the divided intestine.‡

When the intestine has been completely divided with a cutting instrument, Scarpa§ is decidedly of opinion, that Ramdohr's operation cannot be undertaken with any probability of success. But, setting out of the question this bold method, at once so

\* Nosogr. Chir. t. iii. p. 345, &c. edit. 4.

† Collezione d'Osservazioni, &c. di Chirurgia, tomo iii. p. 60. 8vo. Roma, 1802.

‡ Inquiry into the Process of Nature in repairing Injuries of the Intestines, p. 121 and p. 134.

§ Sull' Ernie Memorie Anatomico-Chirurgiche; mem. iv. fol. Milano, 1809.

amusing and captivating to the inexperienced student, this eminent professor offers a variety of arguments against sewing the intestines at all, and asserts, that, *in all cases of penetrating wounds of the abdomen, attended with injury of the intestine, whether the canal be opened longitudinally, or transversely, a suture is always not merely useless, but even dangerous and fatal.* In whatever manner it is practised, says he, one cannot avoid the evils which must originate from the punctures, however few, and from the passage of the ligatures through the coats of the intestine; a part endued with exquisite sensibility, and whose external tunic is much disposed to inflame, and rapidly to communicate the inflammation to all the other abdominal viscera. It has (says Scarpa) been unfortunately proved, by the experience of several ages, that, in most of the cases, in which the intestine has been stitched in penetrating wounds of the belly, the patients have died in the greatest agony. If a few escaped the dangers of this operation, it was only because in them the stitches soon cut their way out, and were voided with the feces, which continued to escape from the wound until it was entirely healed.

All surgeons of experience, and particularly those of large hospitals, have often seen wounds of the right or left iliac region, accompanied with injury of the great intestine. They may also have noticed in these examples, that, after the subsidence of the local and general inflammatory symptoms, the wound still continues to discharge feces for a certain time; but that afterwards it contracts, and the excrement resumes its usual course. These wounds almost always heal\* completely: first, because the adhesion of the large intestine to the parietes of the abdomen, prevents the feces from being extravasated in the cavity of the peritoneum; and, secondly, because the ample capacity of the same bowel always presents a ready passage for the feces, notwithstanding the progressive, and sometimes quick, closure of the external opening.

If, in the instance of a penetrating wound of the belly, attended with injury of the small intestines, it were in the surgeon's power (as indeed it is) to return the bowel into the abdomen, so that the opening in it may exactly correspond to the wound in the abdominal parietes, there could not be a doubt of its quickly acquiring adhesions to the peritoneum, which lines the part around the internal orifice of the external wound. Hence, the feces would readily escape from the outer wound, and at length the artificial anus would close, and the feces resume their natural course, just like what happens in wounds of the large intestines. The narrow diameter of the small intestines

\* See Larrey's *Mém. de Chir. Mil.* t. ii. p. 161.

would not make an insurmountable obstacle to the passage of the feces, if these were, as they usually are, in this part of the alimentary canal, in a sufficiently fluid state; and besides (as Scarpa observes,) is it not proved by experience, that they resume their natural course, after the cure of an artificial anus, even when a considerable noose of the small intestines has been destroyed by gangrene, and when the two ends form by their reunion a very acute angle? Scarpa then feels no hesitation in admitting the possibility of curing wounds of the small intestines, without having recourse to a suture. It would not, he says, be difficult to quote examples of such cures; and one is related, which fell under his own observation. He afterwards describes the incessant pressure made by the abdominal muscles and diaphragm upon all the viscera, as the cause which makes the wounded intestine enter the external wound, and soon adhere to its edges, instead of quitting it. When these adhesions are formed, all danger of extravasation is over. He observes, that one should neglect no remedies, internal as well as external, which may be of use in moderating the patient's sufferings, diminishing the impetus of the circulation, and bringing the inflammation down to the degree suited to the formation of adhesions. He recommends keeping the external wound open, with the same precautions, and according to the same indications, which are to be attended to in the treatment of an artificial anus. The principal object of these precautions is to let the treatment be such, that the external wound may only diminish in proportion as the evacuation from the lower part of the intestinal canal increases.

The very nature of the process, by which the reparation of wounds of the bowels is effected, is a weighty argument against the employment of a suture. In their cicatrization, they follow quite a different course from that of simple wounds of the skin, muscles, or any other parts of the body. Their edges never become immediately applied to each other, and therefore, strictly speaking, they do not reunite. Their cure is altogether completed through the medium of the surrounding parts; that is to say, by the adhesions which the intestines contract with the great sac of the peritoneum lining the cavity of the abdomen, or with the productions of this membrane, which compose the external covering of the greater part of the viscera.\*

Even from the description which Mr. Travers has given of the process of reparation, in the cases where sutures are employed, we may conclude, that the stitches can be of little service; for, says he, "the action of the longitudinal fibres being opposed to the artificial connexion, *the sections mutually re-*

\* See a Case recorded by Littere in Acad. Royale des Sciences, an. 1705.

*cede as the sutures loosen by the process of ulcerative absorption.*"\* Unless, therefore, it be allowable to suppose, not only that the divided portions of bowel can be sewed together so closely and accurately at every point as to remove all possibility of effusion of its contents, but that this can also be done without risk of exciting inflammation of the bowel, thus handled, dragged, and stitched, I must fully agree with Scarpa, respecting the impropriety of thus boldly sewing up wounds of the bowels, with as little scruple as a hole in a glove.

In some former editions, I have said, that if a case were to present itself, in which a protruded intestine were extensively cut, or its whole diameter completely divided, I should venture to make a single stitch with a small needle and piece of fine silk. But subsequent reflection and information make me doubt, whether this limited employment of the needle would be necessary; and if not necessary, it would undoubtedly be improper. The following case, which as well as Ramdohr's memorable experiment, is at variance with another statement, that wounds amounting to a direct division of the canal are irreparable, and therefore invariably fatal,† furnishes an unequivocal proof, not only that an intestine may be completely cut through, and the injury not always be fatal; but that the cure may be effected without any stitching whatever of the bowel. At the assault of Cairo, in 1799, M. N. — was struck by a ball, which divided the muscular parietes of the abdomen, and a portion of the ileum. The two ends of the bowel protruded, were separated from each other, and very much distended. The upper end was averted, its contracted edge strangulating the intestinal tube, as the prepuce does the penis in paraphymosis. The progress of the contents of the bowel being thus obstructed, they accumulated above the constriction. Larrey began with making four small incisions in the constricted part of the intestine; he then passed a ligature through the portion of mesentery corresponding to the two ends of the bowel; reduced them as far as the edge of the opening, which he took care previously to enlarge; and, having dressed the wound, he awaited events. Without detailing the subsequent particulars of the case, suffice it to say, that, in a few months, it ended in a perfect recovery.‡

It is curious that Flajani, who has so decidedly reprobated Ramdohr's practice, and mentioned facts against it from his own experience, should recommend stitching a wounded and pro-

\* Inquiry into the Process of Nature in repairing Injuries of the Intestines, p. 28.

† Op. cit. p. 133.

‡ Larrey, *Mém. de Chir. Militaire*, t. ii. pp. 160, 161.



truded bowel in any manner; for, with the exception of his unfortunate trials of inserting one end of the bowel into the other in the cases which occurred in the hospital at Rome, he records only two instances in which he stitched the intestine, and, in both these, the bowel became gangrenous, and the patients lost their lives.\* We may therefore infer, with Mr. John Bell, "that if there be a work of supererogation in surgery, as I believe there are but too many, surely this of sewing an intestine is one."†

Every reflection, then, which I can make on this subject, leads me to adopt Scarpa's sentiments, in relation to sutures, and the indications which should be fulfilled. The chief indication, and that on which the patient's safety mainly depends, consists in keeping the external wound open, in order that the feces may find a ready outlet. The wounded bowel soon contracts adhesions to the inner lips of the wound of the belly, and then we have nothing to fear from an extravasation of intestinal matter in the cavity of the peritoneum. Afterwards, in proportion as the feces resume their natural course, the external wound is to be allowed to diminish, and entirely heal up.‡

In every instance of a penetrating wound of the abdomen, attended with injury and protrusion of a portion of the intestinal canal, the displaced part is to be reduced, whatever we may choose to do in respect to the free or limited employment of stitches, or their absolute rejection. The reduction should be performed as speedily as possible, before the bowel has suffered much from exposure, constriction, &c. and also before any adhesions have formed at the inner orifice of the external wound; adhesions, which would make the reduction of the protruded part impracticable. Of course, when the wound is so small, that the reduction cannot be effected without handling and bruising the bowel immoderately, it ought to be carefully enlarged with a curved bistoury, guided on a director. Indeed, according to Scarpa's principles, one would suppose, that the wound, if not free, should always be dilated, as by this means the ready escape of any extravasated matter would be insured. The rest of the treatment consists in antiphlogistic measures, more especially copious and repeated venesection, with the view of counteracting the danger of peritoneal inflammation. With respect to the dressings, they cannot be too light, simple, and superficial, except when the stoppage of evacuation in the natural way, and the issue of the intestinal contents from the

\* Collezione d'Osservazioni, &c. di Chirurgia, t. iii. pp. 35-41. In one case, the protruded bowel was a portion of jejunum; in the other, a piece of colon.

† Discourses on the Nature and Cure of Wounds, edit. iii. p. 320.

‡ Scarpa sull' Ernie Memorie Anatomico-Chirurgiche, mem. 4.

breach in the bowel, are such as to lead us to adopt particular means for hindering a premature closure of the external wound.

The pressure of the elastic bowels, and of the diaphragm, and abdominal muscles, not only frequently presents an obstacle to the wide diffusion of extravasated matter, but often propels it towards the external wound.\* We can conceive no power capable of overcoming the resistance so produced to the extensive dispersion of extravasated fluids in the cavity of the abdomen. Numerous cases are on record, of persons being stabbed, or shot, through the body, without any effusion in the abdomen, or other very serious consequences. In some few of these instances, the bowels perhaps might have eluded the ball, or point of the weapon; yet it is highly probable, that, in most of them, the bowels were injured, and that an extravasation of the intestinal matter was impeded by the pressure, to which I have referred. In many of the cases, the intestines were known to be wounded.†

#### PENETRATING WOUNDS ATTENDED WITH INJURY OF THE VISCERA, BUT NO PROTRUSION.

A wound of the intestines is indicated by the discharge of blood with the stools, and sometimes by the escape of fetid air, or of intestinal matter from the external wound. Such an injury, however, when the wounded bowels lie concealed in the belly, does not always admit of being immediately known with certainty. In the majority of examples, there is at first no escape either of air, or of the contents of the bowels, from the external wound; the quantity of blood, voided per anum, may be inconsiderable; and however this may be, none at all will generally be discharged downwards, until a certain time after the accident. Wounds of the small intestines, especially of the duodenum and jejunum, are indeed usually followed by great anxiety, paleness of the countenance, syncope, cold perspirations, and a small, intermitting, tremulous pulse; but, these symptoms are far from being unequivocal, and they cannot be said to furnish any positive information, because a superficial cut, or unimportant stab, frequently causes similar indisposition in subjects of nervous, irritable, or timid habits. Our inability, however, to say positively, in every case, whether

\* On this subject, I would particularly recommend the reader to consult two essays by M. Petit le Fils, one entitled "*Essai sur les Epanchemens et en particulier sur les Epanchemens de Sang;*" the other, "*Suite de l'Essai sur les Epanchemens,*" in *Mém. de l'Acad. de Chir.* tom. ii. and iv. 12mo.

† Recoveries are recorded in *Wiseman's Surgery*, p. 371. *Œuvres de Paré*, liv. x. chap. 35; *La Motte, Traité Complet de Chir.* Albucasis, lib. ii. cap. 26; *Ravaton, Traité des Playes d'Armes à Feu*, chap. 6. &c. &c.

the bowels are injured or not, is of no practical importance; because, when the nature of the accident is not clearly manifested by some peculiarity or severity of the symptoms, the case ought to be treated on common antiphlogistic principles; and also when circumstances leave not the smallest doubt of the intestines being hurt, the same treatment is the only rational plan. Wounds of the small intestines are more dangerous, than those of the large; and the nearer the injury is to the pylorus, the greater is the risk. Such cases are also, much more frequently than injuries of the large intestines, the cause of extravasation. In the latter examples, the symptoms are generally milder, and either the passage of the intestinal contents outward through the wounds more easy and certain, on account of the bowel being more fixed, than the rest of the intestines; or their passage towards the anus more ready, by reason of the greater capacity of the cœcum, colon, and rectum.

There are several other facts highly interesting, and absolutely necessary to be remembered in considering wounds of the bowels: my limits, however, oblige me to pass over the rest of this subject with as much brevity as possible; for which, the fuller account in my dictionary will also afford a just excuse. Were it not for these considerations, I should have felt myself obliged to enter into explanations of the particular appearances presented, as well by punctured wounds, as by transverse and longitudinal cuts in the intestinal canal; and to comment on the circumstance of small punctures being obliterated by the protrusion of the villous coat. I should also have had to point out the results of Mr. Travers's experiments on dogs, proving that, in these animals, a division of the small intestine, as far as the mesentery, is always fatal; that generally in wounds of the intestinal canal, the retraction, immediately following the injury, is a chief obstacle to its reparation; and that longitudinal wounds of the bowels are more easily repaired, than such as are transverse. This tendency of the two portions of a divided bowel to recede from each other, tends to show, that the only mode of spontaneous reparation consists in the formation of an adventitious canal, by the encircling bowels and their appendages.

In the preceding part of this chapter, I have adduced many arguments, casting doubt on the propriety of sewing up a wound in a protruded bowel; but, when the injured intestine lies in the cavity of the belly, the rashest surgeon, the greatest admirer of needles, would never think of ripping open his patient for the sake of performing so cruel and fatal an experiment. In fact, as I have already stated, we rarely know at first, that the bowel is injured; for extravasation, as will be presently related, is not the most usual consequence of a wound of an intestine; when it happens, the extravasated matter does not always flow



out of the external wound, and indicate the nature of the accident; and, if an extravasation should become manifest in a later stage of the case, it would then be impossible to get at the wound of the bowel, on account of the adhesions, which generally form with surprising rapidity. Even if the wound of the intestine were known to exist directly after the receipt of the injury, and a suture were not objectionable, on grounds already detailed, it could not be applied, without enlarging the external wound, searching for the wounded bowel, and drawing it out of the cavity of the abdomen. By these steps, a wound, not at first essentially fatal, might be so altered for the worse, as to leave no possibility of recovery. When an intestine is first found to be wounded, from the occurrence of extravasation a day or two after the injury, a suture is entirely out of the question, as by this time, the part is entirely fixed in its situation by the adhesive inflammation, that salutary process, which also circumscribes the effusion, and throws out an effectual partition between the extravasated fluid and the general cavity of the peritoneum.

When the wound of the intestinal canal is situated in the abdomen, closely behind the external wound, a suture is also unnecessary, because if care be taken to keep that opening from closing too soon, the contents of the gut will be discharged outwardly, and there will be no reason to fear their diffusion among the viscera. Nor is the wounded bowel at all likely to slip away from the outer wound, if the patient be kept duly quiet for a few hours, after which the adhesions render a change in the situation of the bowel quite impossible.

In a penetrating wound of the abdomen, caused either by gun-shot or a pointed instrument, if no protrusion of intestine take place, the lancet, abstinence, and quietude, should be our chief dependence. In short, as the main danger is inflammation of the peritoneum and bowels, the rigorous adoption of antiphlogistic treatment is indispensable. Pain and tension must be relieved by leeches, fomentations, and the warm bath; and if any purgative medicine be given, (which, however, I think should never be done before time has been afforded for the formation of adhesions,) it should be of the mildest description possible. Castor oil is perhaps the safest which can be employed. In these cases, indeed, clysters are generally to be preferred to any other means of emptying the bowels. By the simple observance of an antiphlogistic plan, wounds, in which several folds of the bowels were hurt, have been happily cured. Authors abound with instances of this kind. One related by Littre, I have already referred to in this chapter. Garengot and La Motte record others; and Dr. Hennen has seen several: one was the recovery of a soldier, who had been shot through



the abdomen with a ramrod, at the siege of Badajos, in 1812. The instrument entered the front of the abdomen, and actually stuck in the vertebræ, from which it could not be disengaged without force.\*

Patients, who have recovered from wounds of the bowels, should afterwards be extremely temperate in their diet, and above all things, avoid taking any kind of flatulent, stimulating, indigestible food. They must also be very careful to keep their bowels regular.

In all cases of penetrating wounds of the belly, the dressings should be light, simple, and superficial. If excrementitious matter be discharged from the opening, the utmost attention must be paid to cleanliness. We should also recollect the precept inculcated by Scarpa, viz. that the external wound should only be allowed to close, in proportion as the feces resume their natural course, with ease and regularity.

Sometimes the intestinal matter continues to be discharged for a considerable time from the wound, and even during the rest of the patient's life, either through a fistula, or an artificial anus. In general, however, this affliction gradually ceases. In almost every collection of cases, we may find examples fully proving, not only that simple stabs of the bowels in the end get well, without leaving a permanent annoyance of this kind, but that large portions of the bowels may even be destroyed by gangrene, and yet the continuity of the intestinal tube be completely re-established. From the facts quoted in this chapter, it would also appear, that a complete division of a bowel is neither certainly fatal, nor necessarily followed by an irremediable artificial anus.

Balls, shot into the abdomen, are occasionally discharged with the stools.

#### EXTRAVASATION.

An occasional consequence of a penetrating wound of the abdomen, is an extravasation in the cavity of the peritoneum. The extravasated matter may be undigested food, chyle, the succus pancreaticus, feces, bile, urine, blood, &c. according to the nature of the injured parts. Fortunately, this kind of accident is far less frequent than an experienced surgeon would apprehend, or than our hearing so much of the *cavity* of the abdomen would lead us to expect. Strictly speaking, no empty space exists within the animal body; and all the parts contained in the abdomen are in close contact with each other, and with the inner surface of the peritoneum. Hence, except under particu-

\* Obs. on Military Surgery, pp. 436, 437.

lar circumstances, though the bowels may be wounded, extravasation is generally prevented altogether; or when it does happen, is seldom extensive, the effused matter all lying in one mass.

If, immediately after a wound of the belly, and of its contents, it be the compact state of the contained and containing parts which at first hinders extravasation, it is that salutary process, the adhesive inflammation, which afterwards renders the occurrence quite impossible; or bounds and circumscribes the effusion, if it should have already taken place. In fact, all the surfaces, in contact with each other, and surrounding the track of the wound, become generally so intimately connected together, by the adhesive inflammation, that the wound forms a sort of canal, entirely destitute of all communication with the cavity of the peritonium; and the rapidity with which such adhesions occur is very great.

When an extravasation is diffused in various degrees over the abdomen, Richter thinks we may generally account for it by the patient having been moved about too much; or by his having suffered violent spasmodic contractions of the intestines, arising from the irritation of the extravasated matter. Urine and bile are more frequently dispersed among the convolutions of the viscera, than blood, chyle, or any other fluid.

According to the investigations of Mr. Travers, the following are the only circumstances, in which an effusion of the intestinal contents can happen. If the gut be full, and the wound extensive, the surrounding pressure is overcome by the natural action of the bowel tending to the expulsion of its contents. But, in defect of either of these states, effusion cannot follow. When, however, air has escaped from the bowel, or blood has been extravasated in quantity within the abdomen, at the time of the injury, the resistance, made to effusion, will be less effectual, although the pressure of the sides of the abdomen is the same, as such fluids will yield more readily than the solids naturally in contact with each other. Effusions are also stated more generally to follow ruptures of the bowels by blows, or falls upon the belly, than ordinary penetrating wounds.\*

When an extravasation is perceived, in the first instance, a part of the wound is to be left open, and the posture of the patient is to be so regulated, that the wound may be as depending as possible, and the effused fluid readily escape. If the extravasation should not be perceived till after the wound has been dressed, we are directed to remove the means employed to close a part of it, and to place the patient in a proper posture,

\* See an Inquiry into the Process of Nature in repairing Injuries of the Intestines, &c. pp. 25-36.

with a bandage applied round his body. When internal hemorrhage is suspected, cold washes and venesection are recommended.

When symptoms of irritation exist, attended with local inflammation, pain, and a fluctuating tumour, denoting the seat of the extravasation, the effused fluid is to be let out by a puncture.\* In the *Memoirs of the Academy of Surgery* may be found observations, recorded by Petit and Le Vacher, illustrating the advantages of such treatment.

When there are no symptoms denoting the exact seat of the extravasation, antiphlogistic means, a suitable posture, and the introduction of a tube into the wound, are the measures which writers then usually recommend. For my own part, I would restrict the treatment to the prevention, or diminution, of inflammation, as here no benefit can be derived from posture, nor from a tube, which does not exactly reach the effused fluid; and the former must often be irksome, and the latter always irritating. Venesection should be freely and repeatedly performed; the belly fomented two or three times a day; and only the lowest regimen allowed. A bandage should be applied round the body, as a rational means of promoting that compact state of all the parts in the abdomen, by which the ill consequences of extravasations are so materially diminished.

Musket balls sometimes pierce and lodge in the bladder, in which circumstances, a surgical operation, resembling lithotomy, will become necessary, as soon as the dangers of the first injury are past.† In wounds of the bladder, a great deal of difference in the degree of danger will depend upon whether this organ happens to be full of urine at the time of the accident, and whether the injured part of it is one, over which the peritoneum is reflected. In all cases, however, the principal danger depends upon the chance of the urine becoming effused, and exciting inflammation and gangrene of the peritoneum, bowels, cellular membrane, and, in short, of every part with which it comes into contact. The obvious indications are to make a free and depending outlet for any urine already effused; to prevent a further extravasation by the continual use of an elastic gum catheter; to keep down and diminish inflammation by copious bleeding and low diet; and to avoid every sort of dressing at all likely to irritate or obstruct the wound itself. The best applications, indeed, are light, simple pledgets, with the strictest attention to cleanliness. The cases are now numerous, in which very considerable wounds of the bladder terminated favourably under such treatment.‡ Wounds of the

\* Richter's *Anfangsgr. der Wundarzneykunst*, band. v. p. 38.

† See Larrey's *Mém. de Chir. Mil. t. iv.*, and Hennen's *Mil. Surgery*.

‡ Such facts are abundant in Larrey's excellent work, especially the 4th Vol. II.—H

bladder are often rendered more dangerous, by being complicated with injury of the intestines.

## CHAPTER XXXIV.

### PSOAS ABSCESS.

THIS signifies a collection of matter, which usually forms behind the peritoneum, in the cellular substance surrounding the psoas muscle. The origin of this disease is not, in general, attended with any symptoms of acute pain and inflammation, nor with any febrile disturbance of the constitution. There is a dull uneasiness in the region of the loins; but this, so far from leading to a suspicion of the nature of the disease, is usually regarded as rheumatic. The matter is formed slowly, and imperceptibly, and occasions, at first, no manifest swelling, nor fluctuation, and no material symptom whatever, excepting the uneasiness in the loins, and a slight weakness of the thigh and leg on the affected side.

While the abscess is attended with no external tumour, the diagnosis is always difficult, and any opinion, founded on the existing symptoms, is very undeserving of implicit confidence.

The outward swelling, at length occurring, may take place in various situations. For the most part, the matter descends in the course of the psoas muscle, passes forward under Poupart's ligament, and occasions an external, fluctuating tumour, quite free from pain and inflammation. The exemption from the latter circumstances is a clear indication, that the matter is not originally formed at the place where it first makes its appearance. The enlargement of the swelling, when the patient draws in his breath; its diminution when he is in a horizontal posture, and when pressure is made; and lastly, the fluctuation perceptible to the surgeon's fingers, when the patient coughs, are circumstances which, combined with the other preceding complaints, clearly evince the nature of the case.

The swelling in the groin seldom becomes very large, because the matter insinuates itself beneath the femoral fascia. In some instances, it descends as far as the knee, where it forms

vol. Flajani relates another case, in which the means were restricted to antiphlogistic remedies, *Collez. d'Osservazioni*, t. iii. p. 39. Thomson saw fourteen examples of wounded bladder recovering. See *Obs. in the Military Hospitals in Belgium*, p. 108, &c.



a prominent swelling. Sometimes it makes its way downwards into the pelvis, and occasions a swelling in the neighbourhood of the anus. Sometimes it tends towards the loins and sacrum, giving rise to a swelling exactly in the place where abscesses often make their appearance in the disease of the hip-joint. In a few instances, the matter causes a swelling in the vicinity of the vertebræ; and, less frequently still, it makes its way through the abdominal muscles, and produces a tumour at some part of the abdomen.

The disease, even before it bursts, or is opened, is frequently attended with loss of appetite, weakness, nocturnal sweats, and other hectic complaints.

Lumbar abscesses are sometimes attended with a carious state of the vertebræ. The affection of the bones is by some considered as a cause; by others, as an effect of the rest of the disease.

The causes of a psoas abscess are frequently involved in great obscurity. Sometimes, the disease is preceded by a violent strain of the loins; but, very commonly, we cannot trace any valid reason for its occurrence.

In considering suppuration, I have recommended, as a general rule, liable to particular exceptions, that acute abscesses ought to be allowed to burst spontaneously. With respect to chronic abscesses, an opposite piece of advice seems proper, and surgeons may generally decide to open them, as soon as their existence is known. If not opened, they do not make their way through the skin for a very long time, during which period, the quantity of matter is continually increasing, and the cavity of the cyst becoming larger and larger. Psoas abscesses cannot be opened before the swelling occurs, on account of their very deep situation, and the difficulty of knowing their existence with certainty. But, when the swelling and fluctuation are evident, the sooner the matter is discharged the better.

Experience shows, that, when a psoas abscess is opened in the common manner, death in general follows sooner, than when the swelling is allowed to burst of itself. The formation of a large opening, but particularly the aperture being afterwards left unclosed, causes an inflammatory affection of the whole cyst of the abscess, and the most violent description of constitutional disturbance. The discharge is profuse, thin, and fetid. The patient's pulse becomes small, rapid, and irregular; copious perspirations, unremitting diarrhœa, and even delirium ensue, and death very commonly closes the scene.

Hence, several practitioners\* are in favour of letting lumbar abscesses burst spontaneously. But, though I must assent to

\* Pearson in his *Principles of Surgery*, p. 112. Pelletan in his *Clinique Chir.* tom. iii. p. 322.

this practice being better, than making a large puncture, and leaving it open, yet I have to remark, that whoever expects the symptoms to be mild on the abscess bursting of itself, will generally find himself deceived. Violent irritation of a hectic constitution usually ensues, and the patient mostly falls a victim.

On the other hand, I have had so many opportunities of appreciating the practice, recommended by Mr. Abernethy\* in these cases, that I must consider it, in the present state of surgery, as the only one warrantable. By it, the severe symptoms, under which patients used formerly to perish, when the abscess burst, or was punctured, and the opening left unclosed, are for the most part avoided, and recoveries are rendered more frequent.

This gentleman's method is to open the tumour with a broad abscess lancet, observing to introduce the instrument somewhat obliquely. Such an opening is generally sufficient for the discharge of the coagula, commonly blended with the contents of lumbar abscesses.

The abscess being completely emptied, the lips of the orifice are to be brought together with sticking plaster, and a compress and bandage applied. The wound generally heals, without trouble.

The matter of course collects again, and, regularly as it is secreted, descends to the lower part of the cyst, on which account the upper part of the cavity will remain a good while undistended, and have an opportunity of contracting. When the integuments are again sufficiently elevated to allow a puncture to be made, without hazard of wounding the subjacent parts, the abscess is to be emptied again, and the wound healed, in the manner above described. Thus the operation is to be repeated as often as may be necessary.

By this method, the cyst of the abscess, particularly its upper portion, is not allowed to be distended, and its cavity gradually diminishes in size.

In conjunction with this treatment, attempts may be made to promote the absorption of the matter by electricity; giving two or three times a week a scruple of sulphate of zinc as an emetic; and by blistering the integuments. Care should be taken not to apply the blister at a part where it may be necessary to make a puncture in the abscess. A discharge should be kept up from the blistered surface by means of the savine cerate. When there is reason to suppose the vertebræ diseased, issues are sometimes beneficial.†

\* On Chronic and Lumbar Abscesses, in *Surgical Works*, vol. ii.

† { When psoas abscess follows, or is connected with, a diseased state of one or more of the vertebræ, as it has been in the majority of the cases

When the abscess seems disposed to burst by ulceration, the event may sometimes be prevented by a timely puncture made at a part of the tumour, where the integuments are free from inflammation.

## CHAPTER XXXV.

### PARACENTESIS ABDOMINIS.

THIS operation consists in making an opening into the cavity of the peritoneum, for the purpose of discharging the fluid collected there in dropsical cases.

The proper instrument for making the opening is a trocar, with a cannula, through which the fluid can readily escape.

Not many years ago, it was the invariable practice to introduce the instrument at the central point of a line, drawn from the umbilicus to the anterior superior spinous process of the os ilium, and on the left side, in order to avoid all risk of injuring the liver.

Modern practitioners usually prefer making the puncture in the linea alba, for several weighty reasons. The first is, that in the other method, you are not sure of introducing the instrument in the exact situation of the linea semilunaris, and consequently may unnecessarily wound the thick muscular parietes of the abdomen, instead of merely a thin tendinous part. Another reason is, that, in the attempt to tap in the linea semilunaris, the epigastric artery has sometimes been wounded by very skilful men. In dropsical cases, the rectus muscle is frequently much broader, than in a healthy subject; and, as it always yields to the distention of the fluid in a greater proportion than

we have seen, a more general plan of treatment than is here recommended by Mr. Cooper, will be found necessary. The object, in the first place, will be to relieve the diseased actions which have taken place in or around the affected bone; for, while that continues, there will be little prospect of affording more than temporary relief for the collection of matter by occasional punctures. Issues, as advised by Mr. Pott, made by the caustic potass, or what is found to be still better, by the actual cautery, must be established and kept up on each side of the diseased spine, a course of purgative medicines, with occasional alterative doses of mercurials, must be given, to subdue the inflammatory action, and restore the healthy state of the alimentary organs, with a light nutritious diet; and as strict confinement to the recumbent posture as the circumstances of the case, or the age of the patient, will admit, must be enforced. }

the lateral layers of muscles, the above measurement is very likely to cause the wound to be made near the course of the epigastric artery.

When the operation is to be performed in the linea alba, the instrument should be introduced about two or three inches below the navel.

As soon as the trochar meets with no further resistance, it is not to be pushed more deeply without any object, and with a possibility of injuring the viscera. The stilet is now to be withdrawn, the cannula pressed a little further into the opening, and the fluid discharged through it.

In consequence of the sudden removal of the pressure of the fluid from the viscera and diaphragm, patients are very apt to swoon, and even become affected with dangerous symptoms. In order to prevent these unpleasant occurrences, the abdomen is to be compressed with a bandage or belt, during the discharge of the fluid, and afterwards covered with a flannel compress, and roller.

In cases of ovarian dropsy, the tumour inclines towards one or the other side of the abdomen, so that the puncture cannot be made in the linea alba, but should generally be made at the point, where the swelling is most prominent, due care being taken to avoid the epigastric artery.

## CHAPTER XXXVI.

### HERNIA.

A **PROTRUSION** of any of the parts, naturally contained in the abdomen, beyond the proper extent of that cavity, not the immediate effect of a penetrating wound, is named a *hernia*.

In common language it is called a *rupture*; an erroneous idea having been formerly entertained, that the case was always attended with a laceration of the peritoneum.

In general, the most movable viscera are the most liable to protrusion. Hence, the omentum and intestines, which are loose and unfixed in the cavity of the belly, are met with in almost every hernia, while the stomach has seldom been observed in such a tumour, and still more rarely the spleen.\* The liver, being connected with the diaphragm, is not subject

\* Ruysch, Advers. Dec. 2.



to complete displacement, though a portion of it has been noticed in large herniæ at the navel.\* The uterus,† ovaries,‡ and bladder,§ however, are liable to protrusion.

But, putting out of present consideration less common cases, in which occasionally few of the abdominal viscera have not been more or less protruded, the usual contents of a hernia are either a portion of intestine or omentum, or of both these parts together.

When intestine alone is contained in the hernia, the case is termed an *enterocele*; when omentum alone, *epiplocele*; and when both are included in the tumour, it is named an *entero-epiplocele*.

When a hernia contains a part of the stomach, liver, or bladder, it is sometimes named accordingly, *gastrocele*, *hepatocèle*, or *cystocèle*.

Besides this division of herniæ into several kinds, deduced from the nature of their contents, there are other surgical distinctions derived from their situations. Thus, when any of the contents of the abdomen slip through the abdominal ring into the groin, the case is termed a *bubonocèle*, or *inguinal hernia*; and when the parts descend lower, into the scrotum or labia pudendorum, the hernia is called an *oscheocèle*. The name of *femoral*, or *crural hernia*, is applied to that which occurs below Poupart's ligament, and is most frequent in women. When any of the abdominal viscera are protruded at the navel, the tumour is termed an *umbilical hernia*, or *exomphalos*. The hernial tumours, which take place below the pubes, near the attachment of the superior head of the triceps and pectineus, are called *herniæ of the foramen ovale*. Sometimes the hernial tumour projects into the vagina, and is named accordingly *hernia vaginæ*; while such protrusions as happen at parts of the abdomen, not comprehended in the preceding account, are called *ventral herniæ*.

One very particular case is termed *hernia congenita*. It exists from the time of birth, and in it some of the abdominal viscera are actually lodged in the tunica vaginalis, in contact with the testicle. Haller and John Hunter seem equally de-

\* Gay, Nourse, and Bohnius; see Pott's Chirurg. Works, vol. ii. p. 121. edit. 1808.

† Chopart and Desault, Traité des Mal. Chir. tom. ii. p. 3; also Ruysch, Hildanus, and Sennertus.

‡ Pott, vol. ii. p. 126.

§ See particularly Recherches sur la Hernie de la Vessie, par M. Verdier, in Mém. de l'Acad. de Chir. tom. ii.; Pott's Works, vol. ii. p. 206. edit. 1808; Mery, Obs. sur différentes Maladies, in Acad. Royale des Sciences, an. 1713. Ruysch, Obs. Anat. Chir. Centuria, Obs. 98; Keate's Cases of Hydrocele, &c.

serving of the honour attached to the explanations of the nature of this particular case.\*

Some years ago, the late Mr. Hey discovered a new species of hernia congenita, to which he gives the epithet *infantilis*, as it can only exist while the parts retain the state peculiar to early infancy. The particularity of the hernia congenita infantilis, consists in the hernial sac being contained in the tunica vaginalis of the testicle. This case differs from the common scrotal rupture, in which the hernial sac lies on the outside of the tunica vaginalis, and also from the common hernia congenita, in which the protruded viscera are in contact with the testicle, and have no hernial sac, except the tunica vaginalis.†

In common cases, the contents of a hernia are always included in a complete membranous pouch, which is derived from the peritoneum. This membrane, as every novice in surgery knows, lines the whole cavity of the abdomen; and when any viscus protrudes out of the belly, it necessarily carries before it a portion of the elastic bag, in which it is naturally included. Such is the simple manner, in which a *hernial sac* is formed. The hernial sac is generally described as becoming thicker and thicker, and as presenting, in herniæ of long standing, the appearance of a dense thick membrane, composed of several layers, easily separable by dissection. But Scarpa assures us, that, in the majority of cases, the hernial sac, strictly so called, does not become perceptibly thickened, and that whatever may be the magnitude, or long-standing of a scrotal hernia, the sac is generally not different from the rest of the peritoneum. The differences, remarked in the thickness and strength of the coverings of a hernia, he says, are not to be referred to the hernial sac; but to certain investments, which are external to it, as for instance, the elongation of the fascia lata, the muscular and aponeurotic sheath of the cremaster, and cellular substance, which is on the outside of the hernial sac. The thickening of these various investments is, no doubt, the effect of the pressure, which is continually made upon them by the displaced viscera.‡ Schmucker§ informs us, that he met with a very thin hernial sac in a man who had been afflicted

\* See Haller's *Programma, herniarum observationes aliquot continens*. Goetting. 1749. His *Opuscula Pathologica*, and also *Opera Minora*, tom. iii. The *Programma* appears to be by far the earliest publication on the subject. Hunter's *Med. Commentaries* seem not to have made their appearance till 1762.

† Hey's *Practical Obs. in Surgery*, p. 230. edit. 2.

‡ Scarpa, *Traité Pratique des Hernies*, trad. de l'Italien, p. 53. 8vo. Paris, 1812.

§ *Chir. Wahrnehmungen*, 2 Th. p. 297.

for twenty years with a large scrotal hernia; but, as Scarpa observes, this fact, which is related as singular, is on the contrary very common. Le Blanc\* and others have noticed, that in crural herniæ, which are not covered by the cremaster muscle, the hernial sac is always thin, and completely similar in structure to the healthy peritoneum. Scarpa infers, therefore, that whenever, in operating upon a recent inguinal hernia, of moderate size, the hernial sac has been found of a thin texture, like the peritoneum, the cellular substance which covers it, immediately below the cremaster muscle, must have been divided, without having been perceived; and on the other hand, that, in operating upon old scrotal herniæ, of great size, the cremaster and subjacent cellular membrane, which, in such cases, acquire considerable thickness and strength, have been mistaken for the hernial sac.

The foregoing statement, however, is allowed by Scarpa to have exceptions; and he admits, with the generality of other surgical writers, that, in certain instances, the hernial sac itself becomes much thicker, than the rest of the peritoneum; especially when the hernia, after being for a long while reduced, protrudes again, and is not kept up; when the tumour has been repeatedly affected with inflammation; or when there are extensive adhesions between the hernial sac and its contents.† When the hernia is very large, the hernial sac sometimes grows thinner, instead of becoming thicker, in proportion to the size and duration of the tumour. This diminution of the thickness of the sac and more external parts, may take place in so considerable a degree, as to render the convolutions and vermicular motion, of the bowels, visible through the skin. When the hernial sac has been burst by a blow, the contents of a rupture may also lie immediately under the integuments.‡

In an epiplocele, as Le Dran observes, there is nothing to be felt, except a doughy softness, which neither absolutely yields to the touch, nor very sensibly resists it.§ The tumour has a flabby, unequal feel; and, when there is no stricture, is perfectly indolent. It is more compressible than that arising from protruded intestine; and when the quantity of omentum is large, the epiplocele can in some measure be distinguished by its weight.

In an enterocele, the tumour is usually more flatulent, tense, and elastic. If the intestine be distended with wind, have any

\* Précis d'Opérat. t. ii. p. 53.

† Scarpa, *Traité Pratiques des Hernies*, p. 56.

‡ A. Cooper's *Anatomy and Surgical Treatment of Inguinal and Congenital Hernia*, p. 3; *Supplément au Traité de J. L. Petit. sur les Mal. Chir.* p. 113.

§ *Operations in Surgery*, p. 73.

degree of stricture made on it, or be inflamed, the swelling will be tense, resist the impression of the fingers, and give pain upon being handled. On the contrary, if there be no stricture, and the gut be neither distended with air, nor inflamed, the tension will be trivial, and no pain will occur upon handling the tumour. When the patient coughs, the enterocele feels, as Mr. Pott observes, just as if it were blown into.\* When an intestine, containing air, is reduced, it frequently occasions a gurgling noise.

In the entero-epiplocele, of course, the symptoms are mixed.

Some herniæ are capable of easy and immediate reduction. This is usually the case, when the aperture through which the parts protrude, is not so small as to produce constriction, and when these same parts have not contracted any adhesions. In old cases of epiplocele, the omentum frequently cannot be reduced, in consequence of the morbid enlargement, which the protruded portion has undergone, even though its neck may not suffer any degree of stricture.

A hernia should always be reduced, if possible; and the parts kept up with a truss.

Many herniæ are incapable of reduction, though not in a state of strangulation, or inflammation; the incapacity of reduction being dependent upon the largeness and quantity of the contents of the hernial sac; a morbid thickening of them; or adhesions, which they have contracted with each other, or with the inside of the sac.

When a bubonocoele is rendered incapable of reduction, in consequence of adhesions, or the largeness of its contents, it fills the scrotum, and displaces the integuments of the penis, in such a degree, that the patient is disqualified for copulation. The course of the alimentary matter is always more or less obstructed, in that portion of the intestines which composes the hernia; the patient is subject to complaints of the digestive organs, colic pains, or even a total stoppage of the intestinal contents. This last accident may arise from the matter accumulating too copiously in a part of the bowel that has lost its power of action, so that the collection continues to increase above the obstruction; or it may be produced by the protrusion of an additional piece of intestine or omentum, which causes the parts, embraced by the opening, through which the hernia descends, to become strangulated. In this last case, therefore, the viscera suffer a painful constriction; and not only is the passage of their contents impeded, but the parts, in the vicinity of the incarceration, are attacked with inflammation. Persons afflicted with herniæ are incessantly exposed to these two dangers, namely,

\* *Chirurgical Works*, vol. ii. p. 21. edit. 1808.



simple obstruction in the protruded bowels, and strangulation of them. The first is frequent in old subjects, and in ancient and voluminous herniæ; the second is most common in young people and adults.\*

Persons with irreducible ruptures, should avoid rough exercise; support the hernial tumour with a bandage; and carefully keep it out of the way of all harm from pressure, bruises, &c., and should avoid costiveness and all irregularity of diet.

The quiet inoffensive state of these cases is by no means to be depended upon: an inflammation of that part of the gut which is down; any obstruction to the passage of the aliment or feces through it; a stricture made on it by the opening, through which it protrudes; are circumstances always likely to put the life of the patient in danger.†

An irreducible omental hernia free from constriction and inflammation, is not productive of imminent danger; but when affected with inflammation from any accidental cause, bad and fatal effects may be induced. A protrusion of intestine into the sac is also constantly liable to happen.

Some herniæ are reducible, but not without difficulty, and a good deal of pain and danger, either in consequence of the large size of the piece of omentum, or its inflamed state; the quantity of intestine and mesentery; an inflammation of the gut, or its distention with feces or air; or the smallness of the aperture, through which the hernia protrudes.

Other hernia are both strangulated, and incapable of reduction, without an operation.

#### SYMPTOMS OF A STRANGULATED HERNIA.

The first symptoms are, a tumour in the situation of the rupture, attended with pain, not only in the part, but all over the belly; sickness, and inclination to vomit; suppression of stools, and some degree of fever. The stoppage of evacuations from the bowels, as Mr. Lawrence has observed, may not always be so clearly marked, where only a part of the diameter of the gut is strangulated; but it will often occur in as great a degree in that case, and be equally insuperable by purgative medicines, as where a complete fold of intestine is included: it even happens occasionally in a mere epiplocele. The action of a clyster on the bowels below the stricture, often produces a stool after the strangulation has taken place; but, when they have been once emptied, the most irritating clysters have no effect.‡ If the

\* Richerand, *Nosographie Chir.* t. iii. pp. 365, 366. edit. 2.

† *Chirurgical Works*, vol. ii. pp. 49, 50.

‡ See a *Treatise on Ruptures*, by W. Lawrence, p. 50. edit. 4. 8vo. Lond. 1824. Both to the student and practical surgeon, this last work will be found highly instructive, every part of the subject being well ex-

reduction be delayed, the vomiting becomes more frequent; all the contents of the stomach, and afterwards those of the bowels, down to the stricture, being rejected. There is great anxiety and restlessness, with a small, quick, and hard pulse, and cold extremities. After a time, hiccough comes on, the pulse is hardly perceptible, respiration weak, and the whole body covered with a cold, clammy sweat. Mortification now takes place, beginning in the protruded viscera, and extending to the containing and neighbouring parts. The patient suddenly becomes easy, the swelling of the belly subsides, the tumour of the part diminishes, and the skin covering it sometimes changes its natural colour for a livid hue. Whether it keep or lose its colour, it has an emphysematous feel, a crepitus to the touch. This crepitus is the sure indication of gangrenous mischief within. In this state, the gut either goes up spontaneously, or is returned with the smallest degree of pressure; a discharge is made by stool, and the patient fancies himself better. This feeling, however, is of short duration; for, the hiccough, and cold sweats, continuing and increasing, with the addition of convulsive symptoms, death soon follows.

The symptoms of a strangulated omental hernia are less severe and rapid, and stools may generally be procured by purgatives, or clysters. However, the nausea and vomiting occur in a very distressing degree. This may be readily conceived, when the connexion of the omentum with the stomach is remembered. The same knowledge will also make us understand the effect of a bent posture in mitigating the symptoms; and of an extended one, in aggravating them. When the body of a person, who has died of a strangulated hernia, is examined, the whole surface of the peritoneum is found inflamed, the intestines participating in the disorder, particularly those above the stricture, which are considerably distended. From the constricted part downwards, the intestine is generally smaller than usual, and not inflamed. The convolutions of the bowels are also connected together by recently formed adhesions; a turbid puriform fluid, with flakes of coagulated matter, is effused in the abdomen; and not unfrequently, spots of gangrene are seen on the intestines.\*

#### CAUSES OF HERNIA.

In the healthy state, the abdomen, considered as a whole, is acted upon by two opposite forces, which counterbalance each

plained, and considered with much judgment and ability. The references inserted are truly valuable, as they at once introduce the reader to an acquaintance with all the best writers upon this important branch of surgery.

\* Lawrence, *op. cit.* p. 55.

other; one is the pressure of the viscera against the parietes of the belly; the other is the reaction of these same parietes upon the viscera, which they contain. If, as Scarpa remarks, in all individuals, and all conditions of life, these two forces were in perfect equilibrium, hernia would not take place; and if, when such equilibrium is broken, the sides of the abdomen were to yield equally at every point, to the impulse of the viscera, the result would be an increase of bulk in the whole abdomen, but true hernia would never be seen. The cavity of the abdomen is always completely filled, the containing and contained parts reacting upon, and mutually pressing against each other. It is by this gentle, but uniform and uninterrupted pressure, that all the bowels reciprocally support one another; and without it, the ligaments of the liver, those of the spleen, and, in general, the various membranous bands of the intestines, would be but very inefficient means for fixing these parts in their respective situations. But, there are certain points of the abdominal parietes, which naturally make much less resistance than others, and which react far more weakly against the pressure of the viscera from within outwards. Such is especially that part, which extends from the pubes to the anterior superior spine of the ilium. This relative weakness of some points of the parietes of the abdomen is evident in certain individuals, as the effect of malformation; and it may be increased by several internal and external causes, equally numerous and diversified. In one of these cases, let the pressure of the viscera be immoderately increased, as happens in a violent effort, a loss of equilibrium between the two above-mentioned forces is the immediate consequence; that is to say, the reaction of the abdominal parietes (at certain points at least) is no longer equal to the force of the impulse of the viscera. The united force of the abdominal muscles, diaphragm, and levator ani, is then directed and concentrated against the weakest point of the abdomen, to which it propels the nearest viscus, or that which, from its movableness, is the most subject to displacement. When this viscus is a noose of intestine, the force which pushes it out of the belly must obviously act at the same time upon the corresponding portion of the mesentery; so that the bowel, as it protrudes, draws the mesentery along with it. When the viscera, disposed to protrude, meet with little resistance on the part of the parietes of the abdomen, the hernia is soon formed, and the mesentery is elongated with equal quickness. We have an example of this fact in the congenital inguinal hernia, where the bowel falls, in some measure, into a sac ready for its reception. On the contrary, in the common inguinal hernia, a totally different arrangement of the parts makes the progress of the disease much slower. In general, the hernia is not produced,

immediately the equilibrium between the force of the impulse of the bowels, and the reaction of the parietes of the abdomen, is destroyed. But, in the groin, a slight elevation is first noticed, which extends from the anterior superior spine of the ilium to the abdominal ring. Some time afterwards, when the intestine has passed out of the ring, the increase of the hernia, and the elongation of the mesentery, make much more rapid, but simultaneous progress.

As Scarpa observes, a variety of practical observations concur in proving, that the proximate cause of hernia must not be imputed to relaxation of the mesentery, but rather to a loss of the equilibrium between the pressure of the viscera, and the resistance of one or several points of the parietes of the abdomen. In infants, where the neck of the tunica vaginalis is not promptly obliterated, and in subjects, who become suddenly emaciated after having been very fat, herniæ originate from the slightest causes. Women, who have borne children, are more liable to the disease than other females; and individuals of either sex, who carry considerable burdens, play on wind instruments, or receive violent contusions\* of the abdomen, are also particularly exposed to ruptures, even when there is not the least reason for suspecting any relaxation of the mesentery. Herniæ of the vagina, a consequence of difficult labours, are another proof of the same truth.

When hernial patients cough, sneeze, or make the slightest effort, they immediately feel the tumour enlarge, and they hasten to support it with their hands. At the same period, the mesentery unquestionably becomes lengthened, in proportion as the bowel protrudes in a greater degree. Indeed, says Scarpa, all the viscera have such a tendency to be displaced, and propelled towards the weakest point of the abdominal parietes, that even those which are the most remote from it, and the most firmly fixed by duplicatures of the peritoneum, may, in their turn, descend into a hernia; a circumstance which anatomical knowledge alone could never have anticipated. Sandifort and Palletta found the cœcum, with a portion of the ileum and colon, in an umbilical hernia. Mauchart, Camper, and Bose, saw the cœcum in an inguinal hernia of the left side; and

\* A. Cooper on Inguinal and Congenital Hernia, p. 13. Where a large portion of the abdominal parietes is weakened by a violent contusion, or the repeated distention of pregnancy, and yields, so as to form a preternatural swelling, containing some of the viscera, the case is named by the French surgeons, an "*éventration*."

"Les éventrations, ou hernies ventrales, susceptible d'engouement ne le sont pas d'étranglement, tant est large l'ouverture par laquelle les parties s'échappent de l'abdomen." Richerand, Nosographie Chirurg. t. iii. p. 405. edit. 2.



Lassus found the left portion of the colon protruding at the right abdominal ring.\*

#### TREATMENT OF A STRANGULATED HERNIA.

When we reflect upon what parts are wounded by the operator; when we view the operation in an abstract light, and put out of consideration the whole of that constitutional disturbance, which invariably results from the continuance of the strangulation; there seems ample cause to believe, that the generality of fatal events, consequent to the operation, are attributable to the disease itself, and not to the attempt made for its relief. It was remarked by the late Mr. Hey, that if Mr. Pott's opinion be true, that the operation, when performed in a proper manner, and in due time, does not prove the cause of death oftener, than perhaps once in fifty times, it would undoubtedly preserve the lives of many, to perform it almost as soon as the disease commenced, without increasing the danger by spending much time in the use of means, which cannot be depended upon.†

Indeed, the necessity of the operation, as soon as some of the most efficacious, and least dilatory, plans of treatment, have been fairly tried, is indicated by daily experience. The intestine is often found in a state of mortification, a very few hours after its protrusion.

Hence, in selecting a method of treatment, previously to the operation, the surgeon should be actuated by a determination to lose no time. The loss of a single hour may launch the patient into a state, from which no subsequent skill can extricate him.

The taxis, or reduction of the hernial contents by the hand, ought to form the primary object of a surgeon called to an incarcerated hernia. To perform this well in bubonocoeles is impossible, without an accurate knowledge of the precise situation of the abdominal ring; and of the direction of that canal, of which the ring is merely the external termination; and it has often been a matter of surprise to me, that many surgical authors, who have been tediously particular in relating the mode of performing the taxis, should never have reminded their readers of the great utility of attending carefully to the situation of the opening, through which the hernia protrudes. The projecting point of bone, termed the *angle of the pubes*, is the

\* Scarpa, *Traité Pratique des Hernies*, pp. 38-43.

† "Cette opération par elle-même n'est pas si effrayante, ni si dangereuse que le vulgaire le croit; et sa fin assez souvent malheureuse, vient ordinairement parce qu'on la fait trop tard, lorsque le malade est déjà en danger de mourir par la seule inflammation, ou par la gangrene des intestins et des parties voisines." Bertrandi, *Traité des. Operations de Chirurgie*, p. 21.

chief guide to the situation of the ring. The opening lies a little above, and on the inside of this bony prominence, which is very distinguishable in the fattest subject.

The contents of an ordinary bubonocoele descend through the canal of the abdominal ring downward and inward, or, more correctly speaking, in the direction of a line drawn from the ilium to the angle of the pubes; the sac, invested by a certain fascia and the cremaster muscle, lying beneath the integuments, in front of the spermatic cord. In attempting reduction with the hand, therefore, all our pressure should be concentrated in the direction upward and outward, so as to press the contents of the hernia in the direction of the axis of the canal of that opening, out of which they protrude. The external oblique muscle should be relaxed. For this purpose, the thorax should be elevated, and turned towards the opposite side. Since, also, the femoral fascia, when tense, tightens Poupart's ligament, and an aponeurosis which is spread over the hernia, the thigh should be bent, and rotated inward.

In the femoral hernia, the viscera descend first downward and then forward, and the pressure should therefore be made first backward and then upward. Indeed, as the tumour mounts over the edge of the falciform process of the fascia lata, it should first be pushed a little downwards.\* The external oblique muscle should be relaxed, and the thigh bent, as in the case of bubonocoele. As Gimbernat and Mr. Hey have noticed, the stricture in the femoral hernia is not made, as was supposed, by Poupart's ligament, but frequently by a band of ligamentous fibres, more deeply situated. But, as this band is connected with Poupart's ligament, the relaxation of the latter must necessarily relax the former part.

No violence should ever be employed in attempting to reduce a hernia with the hand. Force can never do good, and may do immense injury to the inflamed viscera in the hernial sac. J. L. Petit,† and Sir Astley Cooper,‡ mention examples, in which the intestine was even burst by it.

Some writers have maintained, that when the rupture becomes painful, we are no longer justified in persevering in attempts at reduction by the hand. Certainly it must be admitted, that all unnecessary and protracted handling of an inflamed hernial tumour ought to be condemned, as tending to increase the inflammation, and accelerate the approach of gangrene. However, were we always to omit a trial of the taxis, because inflammation of the parts had come on, I believe, that

\* See Hey's Practical Obs. in Surgery, p. 150. edit. 3.

† Supplement au Traité de J. L. Petit sur les Maladies Chir. p. 113.

‡ On Inguinal and Congenital Hernia, p. 3.

there would often be a necessity for having recourse to the knife, when the taxis, either alone or assisted by other means, would answer every purpose.

I have reduced ruptures with my hand, when they have been in a very painful state, attended with every symptom of strangulation.

When manual attempts at reduction have failed, other auxiliary means should be immediately tried. In the opinion of the most experienced men, bleeding, cathartics, clysters, cold topical applications, the warm bath, and tobacco smoke, or decoction, introduced into the large intestines, are the most efficacious. Yet it is not enough to possess this information; for, to render our knowledge likely to be productive of a judicious practice, it behooves us to learn precisely what degree of reliance should be placed upon each of these means, and the exact order in which they ought to be tried, so as to procure the greatest chance of relief, without occasioning any hazardous delay, beyond that critical moment, at which the operation is most strongly indicated.

When reduction by the hand proves impracticable, I am inclined to think venesection should be immediately practised. The testimony of the best writers is in favour of this plan; and the little time consumed in trying its effect, is another weighty circumstance in its recommendation. It is advisable on the principle of its counteracting inflammation, and of producing a temporary weakness and even syncope, with a general relaxation, highly favourable to the success of the taxis.

A strangulated hernia is to be regarded as a disease, accompanied with a considerable tendency to inflammation: the impeded functions of the intestinal canal may, and do certainly, produce an alarming disorder of the constitution; but, I cannot help considering the advanced progress of the inflammation in the contents of the hernia, as having a chief share in producing death, the degree of danger being in some degree proportioned to the state of the protruded viscera. Mr. Wilmer's idea, that bleeding renders the subsequent operation more dangerous, is most ably refuted by Mr. Hey. Bleeding is not, however, to be looked upon as capable of preventing the effects of such inflammation altogether, but only of retarding the progress, which they will still make as long as the cause of the inflammation, the strangulation of the viscera, continues.

Sometimes, in very old and feeble subjects, the use of the lancet may be judiciously omitted. In hernia, attended with mere obstruction, from accumulation of the contents of the bowels in the protruded viscera, and not from strangulation, bleeding is also unnecessary.

Mr. Alanson thought, that bleeding never promoted the suc-

cess of the taxis. However, this opinion is contrary to those of Le Dran, Pott, Richter, Callisen, Sabatier, Flajani, and of numerous other experienced surgeons.

In performing the operation, a large opening should be made in the vein, in order that the sudden evacuation of the blood may make the patient faint; for, the taxis is observed to be particularly successful during a swoon. For the same reason, a liberal quantity of blood should be taken away.

Having bled the patient, it becomes advisable to make another attempt to reduce the parts by the hand; and if fainting should occur, this favourable opportunity ought not to be lost.

Too often, however, the hernial contents are not to be released from their incarcerated state by such mild treatment.

I calculate, that a quarter of an hour would be amply sufficient for putting in practice the attempts at reduction by the hand, and bleeding.

Success not being obtained, I would next recommend the warm bath, if one could be speedily provided. But, though I have reduced several hernia, while patients have been in the bath, and though I place considerable reliance in its efficacy, so perilous does delay appear to me in these circumstances, that should any great length of time be unavoidably necessary to prepare it, I would recommend it either to be dispensed with entirely, or to be prepared during the trial of other means.

In case a warm bath cannot speedily be prepared, let not the surgeon tamper with a disease so urgent in its nature, so rapid in its progress, and so often fatal from the inert and timorous conduct of the practitioner. Let him not, at all events, consume any material time in trying the effects of clysters and cathartics. The utility of the latter, in cases of enterocele, may be very rationally questioned. Every one, however, will admit, that, in cases of inflamed epiplocele, they ought to be administered.

In every instance, in which there is reason to believe the strangulated hernia to be of the intestinal kind, no sooner have the repeated attempts at reduction with the hand, assisted by bleeding, and the warm bath, failed, than the surgeon should immediately try the united effect of cold, applied to the tumour, and of a tobacco clyster, or its fumes, introduced into the large intestines. Snow, or ice pounded, and mixed with salt, and put into bladders, should be applied to the swelling. If snow or ice cannot be obtained, the evaporation of cold spirituous lotions from the surface of the swelling, may be tried as a substitute.

In preparing the tobacco clyster, it is wrong to lose half an hour in infusing the plant. A drachm of it may be macerated ten minutes in a pint of boiling water, and the liquor then



strained for use. One half should be first injected, and soon afterwards the other, unless the effects of the first quantity appear too violent.

Frequently, during the combined action of the ice and tobacco, the contents of the hernia return spontaneously into the abdomen; but, when this is not the case, the surgeon should make another final effort to reduce the parts by the hand. If this again fails, even when the patient is duly under the influence of the tobacco, and if the symptoms of strangulation, at the same time, continue to increase, the operation ought to be undertaken, without further delay.

#### OF HERNIÆ WITH OBSTRUCTION, BUT NOT STRANGULATION.

What the French surgeons call "*engouement*," is produced by the accumulation of the intestinal matter in the protruded portion of the bowels. It is most common in old large herniæ, and depends upon the difficulty, with which the contents of the intestines ascend against their gravity, so as to pass from the bowels, contained in the hernia, into the rest of the intestinal canal. They lodge in the part; the canal becomes obstructed; the intestinal contents accumulate, in larger and larger quantities, between the stomach and the seat of the obstruction; and the hernial tumour enlarges, being at first indolent and soft, and not elastic and painful, as in a true case of strangulation. The *engouement*, or simple obstruction of a hernia, is essentially different from incarceration, or strangulation, inasmuch as it may exist, without there being any disproportion between the opening, through which the hernia takes place, and the protruded parts. At length, the abdomen becomes tense; the tumour grows larger and painful; the patient, who had only been troubled with nausea, now vomits up the contents of the bowels; fever commences; and the general symptoms of strangulation occur, in combination with such as originate from the mere obstruction. This latter state, unattended with actual strangulation, may exist several days, and even weeks, without putting a period to life; while, on the contrary, the bowels, when strangulated, immediately inflame, and sometimes become gangrenous in the course of four-and-twenty hours.

According to the French surgeons, bleeding is seldom or any use in hernia, accompanied with mere obstruction. Cold applications to the swelling, brisk cathartics, and laxative clysters, are the best means.

Attempts at reduction may be frequently repeated. The disease is very different from a hernia with strangulation; and examples have occurred, in which the obstruction has been got rid of, as late as eight, ten, or eleven days after its commencement. However, if the patient were aged and infirm, Riche-

rand thinks that we ought not to let him fall a victim to abstinence and suffering, protracted thus long; but attempt his relief by an operation.\* According to my own judgment, the surgeon should never have recourse to an operation in herniæ of this description, without having given active purgatives, and the tobacco clyster, the fairest trial.

#### BUBONOCELE, OR INGUINAL HERNIA.

Of all the various species of hernia, the inguinal is by far the most common. In the unincarcerated and reducible state, it is denoted by the following circumstances:

First, By a tumour arising from a protrusion of some part of the bowel through that canal or opening which is commonly called the abdominal ring, and which in the male subject gives passage to the spermatic cord; and in the female, to the round ligament of the uterus. The swelling is not preceded by any symptoms of inflammation; and, though its commencement is generally slow and gradual, it frequently undergoes a sudden enlargement, and is, for the first time, particularly noticed by the patient himself, after he has been making some violent effort.

Secondly, By the diminution, or even total disappearance of the swelling, when the patient lies upon his back; by its recurrence, when he stands up again; and by the impulse, which is felt in the swelling, whenever he coughs.

About an inch and a half from the pubes, the strongest and thickest part of the tendon of the external oblique muscle splits into two fasciculi. The upper fasciculus, which is broader than the lower, is inserted into the edge of the angle of the pubes, where it seems to intermix with the fibres of the corresponding part of the opposite side, and with the ligamentous substance, uniting the ossa pubis. The lower, which is narrower, but stronger and more elastic, is inserted by means of a strong tendon, into the spine and crista of the pubes.

By the separation of these tendinous fasciculi, the abdominal ring is produced, which is rather of a triangular shape, the os pubis forming the base of the triangle; the two fasciculi, or, as they are termed, *pillars*, its sides; while the apex is the part at which they separate from each other. It is not, however, pointed, since some transverse fibres, which connect the two pillars together, round off its upper part.†

The aponeurosis of the external oblique muscle is covered, for a certain extent above the femoral arch, and the abdominal ring, by a very delicate expansion of the aponeurosis of the tensor fasciæ latæ. A portion of this thin aponeurotic layer

\* Nosogr. Chir. t. iii. p. 375, &c. ed. 2.

† See Lawrence on Ruptures, p. 177.

extends beyond the ring, over the cremaster muscle, which it accompanies even into the scrotum, and is there lost in the cellular substance which connects the external surface of this muscle to what anatomists have called the dartos. The other portion extends towards the ilium. This tendinous expansion is intimately adherent to the edge of the femoral arch, and to the circumference of the abdominal ring, whereby it must tend to resist protrusions through either of these openings.\* The internal oblique muscle is closely attached to the inner edge of the crista of the ilium, the anterior superior spine of the same bone, and to the origin of Poupart's ligament. Its inferior fibres, instead of pursuing an oblique direction, from above downwards, become transverse, and extend in fleshy fasciculi over the external angle of the ring. Its aponeurosis, says Scarpa, goes in front of the rectus muscle, and terminates in the linea alba. Its inferior attachment is to the spine of the pubes, immediately behind the insertion of the tendinous pillars of the ring. The lower muscular fibres, about eight lines from the external angle of the ring, open to form a passage for the spermatic cord, splitting into two fleshy portions; one external; the other internal. The external is attached, for a certain extent, to Poupart's ligament, and constitutes the principal origin of the cremaster muscle, the fibres of which cover the spermatic vessels, and accompany them into the scrotum, terminating in a species of aponeurotic muscular sheath, which includes the spermatic cord, with its cellular covering, and the tunica vaginalis testis.†

The transverse muscle, situated under the internal oblique, is attached to the inner edge of the crista, and to the anterior superior spine of the os ilium. Its fleshy fibres neither extend so low, nor so near Poupart's ligament, as those of the internal oblique; nor do its lowest fibres undergo any change of direction, since they form no outlet for any thing. The spermatic cord passes through the inferior fibres of the internal oblique, which separate to afford a passage for it; but it only glides under the lower fleshy edge of the transverse muscle. *The exact point, where it clears the latter muscle, is about an inch nearer the ilium, than where it pierces the internal oblique,* and where, as Scarpa has related, the chief origin of the cremaster is situated. The aponeurosis of the transverse muscle passes in front of the rectus, to be inserted into the linea alba; and below the abdominal ring it is implanted into the pubes; behind the attachment of the aponeurosis of the external oblique.‡

\* Scarpa, *Traité Pratique des Hernies*, p. 22.

† *Ibid.* pp. 23, 24.

‡ *Ibid.* p. 25.

On the side towards the peritoneum, the abdominal ring is shut up by the aponeurosis of the internal oblique and transverse muscles; which aponeurosis, though much weaker than that of the external oblique, hinders any direct protrusion of the bowels into the ring. The passage of the spermatic cord, through the three layers of abdominal muscles, is not directly from behind forwards, in the direction from the sacrum to the pubes, but *it takes place very obliquely*, and in a line drawn from the ilium to the pubes. It is obvious, then, that *what is commonly named the abdominal ring, is rather a canal, the internal or deepest extremity of which corresponds to the point where the spermatic cord passes under the margin of the transverse muscle, while its external, or superficial termination, is the abdominal ring, strictly so called.* The spermatic cord crosses the abdominal muscles, one after the other, and in three different places, which do not lie directly from behind forwards. *The point where the cord runs under the inferior margin of the transverse muscle, is the furthest from the pubes, or about three inches from it. That, where the cord passes through the lower fleshy fibres of the internal oblique, or between these fibres and the principal origin of the cremaster, is an inch from the preceding point. Lastly, the place where the cord passes out of the abdominal ring, is only an inch from the pubes, and almost immediately under the integuments of the groin.* Thus, we see, that *the abdominal ring, taken in the sense of the whole of the opening for the transmission of the spermatic cord from the flank to the pubes, is a true canal, about three inches in length, formed in front by the aponeurosis of the external oblique muscle, and behind by the separation of the lower fleshy fibres of the internal oblique, by the lower edge of the transverse muscle, and by the aponeurosis of these two latter muscles, which descending lower than the abdominal ring, and being inserted into the pubes, hinder all direct communication between the ring and the cavity of the abdomen.\**

In the situation of Poupart's ligament, and in the track of the spermatic cord previously to its exit from the ring, the peritoneum is protected by no very firm part, except the aponeurosis of the external oblique muscle; for little stress can be laid upon those of the internal oblique and transverse muscles, which are here very delicate.†

The peritoneum is united to the muscles and aponeurosis of the abdomen, by a very supple, extensible, cellular substance, which, without any laceration, allows the former membrane to become displaced.

\* Scarpa, *Traité Pratique des Hernies*, pp. 26-28.

† *Ibid.* pp. 31, 32.



The loose cellular substance, which envelops the spermatic vessels behind the peritoneum, passes, along with them, under the fleshy margin of the transverse muscle, and through the separation of the lower fibres of the internal oblique; in short, it accompanies these vessels through the whole extent of the inguinal canal, and into the scrotum, as far as the point where they enter the testicle. This cellular covering is a continuation of the similar texture, which is found every where upon the external surface of the peritoneum. As it approaches the ring, it becomes more and more voluminous; and, as soon as it is on the outside of this aperture, it is enclosed with the spermatic vessels and tunica vaginalis of the testicle, in the muscular and aponeurotic sheath of the cremaster, which extends to the bottom of the scrotum.\*

The epigastric artery runs near the external side of the abdominal ring. It arises from the external iliac artery, a little way from the crural arch, and about an inch below the convexity of the great bag of the peritoneum. The space between this convexity of the peritoneum, and the origin of the artery, is filled up by a good deal of cellular membrane, which is continued over the spermatic cord and the femoral vessels. The epigastric artery, originating sometimes from the inside, and sometimes from the front part of the external iliac, by forming with the latter vessel a more or less acute angle, conceals itself almost immediately under Poupart's ligament, and the aponeurosis of the internal oblique and transverse muscles. Thence, passing over the convexity of the peritoneum, it ascends obliquely towards the rectus muscle. In its course near Poupart's ligament, it is crossed by the spermatic cord.†

*The exact point where an inguinal hernia usually begins, is that which corresponds, in the fœtus, to the communication of the tunica vaginalis with the peritoneum, and, in the adult, to the passage of the spermatic cord under the transverse muscle.* According to Sir Astley Cooper, it is about an inch and a half from the external orifice of the abdominal ring; according to Scarpa, about three inches from the pubes. In the healthy state, says the latter anatomist, the peritoneum here presents a small depression, the depth of which increases in proportion as the spermatic cord is drawn further downwards. *It is this little bag, this kind of digital appendix, which, by its progressive development, constitutes the hernial sac.* Lying upon the front of the spermatic cord, it first makes its appearance under the lower margin of the transverse muscle; thence it extends itself into the separation

\* Scarpa, *Traité Pratique des Hernies*, p. 34.

† Ibid. p. 36.

between the lower fleshy fibres of the internal oblique, invariably following the spermatic cord, on the front of which it is situated; and after having thus traversed all the inguinal canal, it finally protrudes at the abdominal ring. In all this course, the hernial sac, as well as the spermatic cord, is situated above the crural arch, the direction of which it follows; and the canal, which it passes through, is of a conical shape, the apex of which is towards the ilium, and the base at the external orifice of the ring.\*

In old hernia, however, things are somewhat different; and, as Sir Astley Cooper† first explained the internal opening of the passage, through which the parts protrude, become situated more directly behind the abdominal ring.

The hernial sac always adheres closely to the spermatic cord through its whole track, from the internal orifice of the inguinal canal to the bottom of the scrotum. At the place where the spermatic cord and hernial sac, joined together, pass through the separation in the lower fibres of the internal oblique muscle, the cremaster muscle is seen going to their external side, and accompanying them beyond the ring, where it is converted into a muscular and aponeurotic sheath, which, embracing the hernial sac, the spermatic cord, and the tunica vaginalis, proceeds with these parts to the bottom of the scrotum. The hernia never descends beyond the point where the spermatic vessels enter the testis, because there the cellular substance of the cord terminates.‡

In old large scrotal herniæ, the cremaster muscle acquires a thickness truly surprising; its fibres, which are naturally very thin, becoming from four to six times more bulky. Where they are spread over the neck and body of the hernial sac, they sometimes present a remarkable firmness, and a yellowish colour. In old scrotal ruptures, it is not uncommon to find the fibres of this muscle intimately adherent to the edges of the abdominal ring; so that a probe cannot be passed between them without much difficulty; while, in recent herniæ, a probe will pass as easily between the edges of the ring and the cremaster, as between this muscle and the hernial sac. In most cases, the apparent thickening of the hernial sac is not owing to such change in the protruded peritoneum itself, but to a thickening in the tendinous expansion derived from the fascia lata, together with a similar alteration of the cremaster, and of the cellular substance immediately on the outside of the sac. Thus, according to Scarpa, in an inguinal hernia, we have directly

\* Scarpa, pp. 44, 45.

† On Inguinal and Congenital Hernia, fol. Lond. 1804.

‡ Scarpa, pp. 46, 47.

under the common integuments, an aponeurosis derived from the fascia lata; under this the cremaster; below this muscle, the cellular substance on the outside of the sac; and, then, the sac itself. This author makes no mention of the fascia, which Sir Astley Cooper describes as being sent off from the external oblique muscle. No doubt, therefore, the aponeurosis, stated by Scarpa to proceed from the fascia lata over the cremaster and hernial sac, is the same thing as what Sir Astley Cooper describes as being sent off from the tendon of the external oblique muscle.

The displacement of the epigastric artery, in the greater number of inguinal herniæ, is another subject of importance. The situation and direction of this vessel, which naturally runs about ten lines from the abdominal ring, are so altered, that it passes across the back of the neck of the hernial sac,\* and is pushed from the outer to the inner side of that opening. In order to comprehend the cause of this displacement, we must recollect that the hernia begins at the very point where the spermatic cord emerges from under the lower margin of the transverse muscle, and that this place is rather nearer the ilium, than the point where the epigastric artery begins its course towards the rectus muscle. In its progressive increase, the hernial sac constantly follows the same track as the spermatic cord, on the front of which it lies. The cord crosses the epigastric artery: the hernial sac, then, before leaving the canal of the ring, must necessarily pass with the cord over that vessel. At the same time, the internal orifice of the hernia enlarging, and the canal of the ring becoming shorter, by the approximation of its two openings, it follows, that, at the period when the hernia begins to appear in the groin, the epigastric artery is of course situated behind the neck of the hernial sac, being displaced from the outer to the inner side of the ring. In a vast number of dissections, Scarpa has met with very few instances of inguinal hernia, in which the epigastric artery was not thus displaced; and, in these exceptions, the weakness of the parietes of the abdomen, between the ilium and pubes, was very remarkable, and, in all the cases, the viscera had protruded through the aponeuroses of the transverse and internal oblique muscle; not towards the ilium, as usually happens, but a little way from the pubes, giving to the upper pillar of the ring an extraordinary curvature, disproportioned to the small size of the hernia. In short, in these individuals, the little digital process of peritoneum, constituting the origin of the hernial sac, had not begun to form under the margin of the transverse muscle, at the place

\* Scarpa, tab. ii. fig. 4, 5, 6, and tab. iii. pp. 4. 6. 8. Camper, *Icones Hern.* tab. x. P. H. tab. xii. M.

where the spermatic cord goes under it, but it had pierced the aponeuroses of the internal oblique and transverse muscles, a little way from the pubes, within the point where the spermatic cord crosses the epigastric artery.\*

To this case, Hesselbach assigns the name of *internal* inguinal hernia, while the more common form of the disease he calls *external*.† The *internal*, while small, is attended with a particular rotundity; it pushes up in a remarkable manner the upper pillar of the ring; it forms a much more considerable elevation about this opening, than an external inguinal hernia of the same size; it does not occasion any cylindrical elevation in the fold of the groin; when reduced, no gurgling noise is heard; and the spermatic cord always lies on its outside. But when the hernia is large, these signs, as Scarpa observes, no longer serve for discrimination.

Though, in the *external* inguinal hernia, the hernial sac commonly lies upon the spermatic cord, it should be remembered, that instances are recorded, in which the vas deferens and spermatic vessels have been situated in front of the sac,‡ as well as other examples, in which the hernia was interposed in various ways between the parts composing the cord.§ These changes are chiefly observed in herniæ of large size. The vessels of the cord, however, are generally but little separated from each other towards the ring, but diverge more and more as they proceed downward. A similar alteration in the position of the vessels of the cord is noticed in large hydroceles.

I have known surgeons disagree whether certain cases were inguinal or crural herniæ; and occasionally the error on one side was not dispelled, till a confused operation, or the death of the patient, had thrown light upon the disease. Practitioners may the more easily fall into such mistakes, in consequence of inguinal herniæ being always expected in men, and never in women;|| while crural ruptures are regarded as a common

\* Scarpa, pp. 68. 71.

† Anatomisch-Chirurg. Abhandlung über den Ursprung der Leistnbruch. Würzburg, 1806.

‡ Le Dran, Traité des Operations, p. 127; Schmucker, Vermischte Schriften, vol. ii. p. 55: Sir A. Cooper on Inguinal and Congenital Hernia, p. 49.

§ Hey's Practical Obs. in Surgery, p. 140. edit. 2; Sir A. Cooper, op. cit. pp. 9 and 10; Camperi Icones Hern. tab. 8 et 13.

|| Bubonocles are occasionally, but not often, seen in women. Several, which were dissected by Cloquet, are related by him in his "Recherches sur les Causes et l'Anatomie des Hernies abdominales, 4to. Paris, 1819." See obs. 13. p. 32; and obs. 20. p. 44. This last case, which was on the left side, was remarkable, on account of the ligamentum rotundum uteri on the right side being accompanied with the diverticulum described by Nuck, which was an inch and a half in length. In the body of another female, aged about fifty, Cloquet found two external inguinal ruptures. See



affliction of females, but a most unfrequent one of males. Deviations, however, from what is ordinary, are possible, and should ever be in the recollection of a consummate surgeon.

In men, a crural hernia may acquire a very large size, ascend above Poupart's ligament, and project over the abdominal ring. The swelling has then a roundish form, and may resemble an inguinal hernia, that contains only intestine, that is gradual in its increase, and that has not yet descended into the scrotum.

I shall not insist on the likelihood of the mistake being discovered, by the impossibility of reducing such a hernia by pressure, directed from below upwards and outwards, in the oblique course of the canal within the abdominal ring. As will be hereafter related, the femoral hernia only admits of reduction by being pushed first from above downwards, and then perpendicularly with respect to the groin. The relation, which the neck of the tumour bears to the crural arch, will enable the practitioner to distinguish the nature of the cases. When a crural hernia is drawn downwards, the crural arch can be traced, extending over the neck of the sac; while, in a bubonocoele, it runs under that part. The spine of the pubes, which is behind and below the neck of the sac in an inguinal hernia, is on the same horizontal level, and rather within it, in the crural rupture.\*

A bubonocoele in women always descends from the abdominal ring, in the direction of the round ligament of the uterus, and tends towards the labium; just as an inguinal hernia in man follows the course of the spermatic vessels, and falls towards the scrotum. On the contrary, the crural hernia may remain below, or rise over the crural arch, but its direction is never towards either the labium, or the scrotum.†

Cirsocele, or a varicose enlargement of the spermatic veins, resembles in several respects a hernial tumour: when large, it dilates upon coughing; it is prominent in the erect posture; and it subsides when the patient lies down. The method of distinguishing the two complaints, consists in putting the patient in the horizontal position, and emptying the swelling by pressure upon the scrotum; the surgeon is then firmly to press upon the upper part of the abdominal ring, when, if the case be a hernia, the tumour cannot re-appear as long as the ring is compressed; but, if the disease be a cirsocele, the swelling returns with increased size, on account of the pressure interrupting the course of the blood through the spermatic veins.‡

obs. 24. p. 48. Other examples of external inguinal ruptures in women, are also recorded at pp. 107. 132. 140, &c. and an internal inguinal hernia in the body of an aged female, pp. 116. 143, &c.

\* Lawrence, p. 393, edit. 3.

† Pelletan, *Clinique Chirurgicale*, tom. iii. p. 28.

‡ See Sir A. Cooper's *Anatomy, and Surgical Treatment of Inguinal and Congenital Hernia*.

Hydrocele may be distinguished by the perfect equality of the whole tumour; its transparency, when a candle is placed behind it; the smallness of the spermatic process; the absence of pain on handling the swelling; the fluctuation of the water; the gradual formation of the tumour; its having begun below, and proceeded upward; its not being affected by any posture or action of the patient, nor increased by his coughing; and, lastly, the absolute impossibility of feeling the testicle at the bottom of the scrotum.

Hernia humoralis, or an inflamed testicle, may be known by the hardened state of the epididymis; the exemption of the spermatic cord from all unnatural fulness; the generally preceding gonorrhœa; the pain in the testicle and loins; the weight of the tumour; and the tense, reddish, smooth, shining, uncorrugated appearance of the scrotum.

An indurated gland may be distinguished from a hernia, by its being unconnected with the spermatic cord, and by its circumscribed, incompressible hardness; and when in a suppurated state, a fluctuation may be felt.

The lodgment of the testicle at the abdominal ring, may be mistaken for an incipient hernia; but, the absence of that organ in the scrotum, and the great sensibility of the tumour, are circumstances, by which an attentive practitioner may always avoid mistake.

Hæmatocele, or a collection of blood in the tunica vaginalis, is particularly apt to be confounded with a hernia, in consequence of its generally proceeding from a blow, and having the same shape as the last disease. But, according to Sir Astley Cooper, the firmness of the hæmatocele; the redness of skin accompanying it; its not dilating when the patient coughs; and the spermatic cord being free from swelling at the ring, will point out the difference of the complaint.

Cysts, filled with water, sometimes form in the course of the spermatic cord. When quite below the ring, they may be readily discriminated by their not being connected with the abdomen. When they reach within the ring, and have no distinct transparency, nor fluctuation, they should be opened with great circumspection. I have known an encysted hydrocele of the cord accompany the existence of an old hernial sac, be mistaken for a protrusion of the viscera, and on account of complaints, induced by a kick in the groin, operated upon, under the idea of the case being a strangulated hernia. When the cyst, the supposed hernial sac, was opened, the fluid which it contained, was discharged, and on introducing the finger, nothing was found but a circumscribed cavity. After a few more incisions, an opening was made into the real hernial sac, which was not suspected of being so, as no viscera protruded. Upon passing the finger upward, some fluid now escaped from the abdomen,

and all seemed uncertainty, as to what the case actually was; nor did the doubts subside, till the parts were examined after death.

#### OPERATION FOR STRANGULATED BUBONOCLE.

The hair should first be removed from the tumour and adjacent parts. The incision is to commence about an inch above the ring, and, unless the tumour be large, is to extend nearly to the lowest part of it. In operating upon a scrotal hernia of middling size, it is of no importance, that the incision tend a little more towards one side of the swelling than the other. But, if the hernia be old, and of large size, the cut should be made exactly in a longitudinal line, that divides the tumour into two equal parts; for, in this degree of the disease, the component vessels of the spermatic cord are frequently separated from one another, and pushed over the sides, or even upon the very front of the lowest portion of the hernial sac. Therefore, by dividing the lateral and inferior part of the sac in such cases, the surgeon would run the risk of cutting the spermatic artery, either alone, or together with the vas deferens.\* The incision through the skin and cellular substance covering the sac, divides the external pudic branch of the femoral artery, which crosses the hernial sac near the abdominal ring, and sometimes bleeds so freely, as to require a ligature. It also exposes the fascia,† which, according to Sir A. Cooper, passes from the external oblique muscle, and covers the cremaster. By beginning the cut above the ring, we gain room where it is much needed, in a subsequent part of the operation, viz. the incision of the stricture.‡

With a pair of dissecting forceps, a portion of the fascia must next be raised, and a small opening made in it, sufficient for the introduction of a director, on which instrument the surgeon is to divide the fascia upward to the abdominal ring, and downward to the end of the first wound.

This division of the fascia exposes the cremaster muscle, which is to be opened precisely in the same manner; when the cellular substance immediately covering the peritoneum, or true hernial sac, will present itself. These investments, as I have already related, are generally much thicker than the sac itself, which, excepting when the hernia has been often inflamed, or adhesions exist, mostly retains its natural thinness and transparency.§

\* Scarpa, *Traité Pratique des Hernies*, p. 100.

† This tendinous expansion, as the reader already knows, is described by Professor Scarpa as a continuation of the fascia lata.

‡ Lawrence on Ruptures, p. 212, edit. 3.

§ Scarpa, p. 104.

The operator is now to take hold of some of this cellular substance, which adheres intimately to the anterior inferior part of the sac, with a pair of dissecting forceps, and thus he is to raise the sac itself. Then, with the edge of the knife turned horizontally, he is to make an opening just large enough to admit the blunt end of a probe, or director; upon which the sac is to be further divided upward to the abdominal ring, and downward to the bottom of the tumour. The anterior and inferior part of the sac is selected as the place for making the first opening, because the intestine seldom descends so low; and whenever fluid is present, it gravitates to this situation. Sir Astley Cooper does not extend the division of the sac nearer to the ring than an inch, in order to avoid making the closure of the wound more difficult, and to lessen the danger of peritoneal inflammation.

The next object is the division of the stricture. Sir Astley Cooper directs the surgeon first to introduce his finger into the neck of the hernial sac, for the purpose of ascertaining the exact situation of the strangulation, which he will find either at the abdominal ring, or about one inch and a half from this aperture, in the direction upward and outward; or, lastly, in the mouth of the hernial sac.

When the stricture is produced by the abdominal ring, the above gentleman recommends the surgeon to pass his finger into the sac, as far as the stricture, and then to convey a probe-pointed bistoury over the front part of the sac, into the ring, which is next to be divided, upward, opposite the middle of the neck of the sac, and to an extent just sufficient to allow the protruded parts to be returned into the abdomen without injury.

The chief advantages of dividing the ring upward, depend, first, on the fabric of this aperture not being so much weakened as it would be by cutting upward and outward, and dividing the transverse tendinous fibres, which cross its upper part; and, secondly, on the safety of the method in regard to the epigastric artery, whether the case be the external, or internal hernia; of Hesselbach, in which last example the artery always lies on the outer side of the neck of the sac. If, however, we were sure of the disease being the less common disease, an internal inguinal hernia, of course, it would then be perfectly safe to cut the ring inwards and upwards.

However, a frequent situation of the stricture is not at the abdominal ring, but at the place where the sac opens into the abdomen; that is, an inch and a half, or two inches towards the anterior superior spinous process of the ilium from the ring. Here the strangulation is caused by the transversalis muscle and its tendon, which pass over the hernial sac, in a semicircular direction, and by a fascia arising from Poupart's ligament,



the semicircular border of which passes under the sac. In this case, Sir Astley Cooper advises the surgeon to introduce his finger into the sac, through the abdominal ring, as far as the stricture; and then a probe-pointed bistoury, with the flat part of its blade turned towards the finger, is to be insinuated between the front of the sac and the abdominal ring, till it arrives under the stricture, formed by the lower edge of the transversalis and obliquus internus. The edge of the instrument is to be next turned forward, and the stricture cut in the direction upward; by which method the epigastric artery cannot be cut, whatever be its situation in regard to the sac. The division should only be of sufficient extent to allow the finger to pass through the strangulation, and Sir A. Cooper makes it with a bistoury, the cutting edge of which extends but a little way from the point.

When the stricture is caused by the neck of the sac itself, the probe-pointed bistoury must be carefully introduced, and a division made directly upward.

The above plan of passing the bistoury between the sac and ring, is now generally rejected, and the preference given to introducing the instrument within the neck of the sac itself, for the division of the stricture.

Having removed the stricture, the next object is to return the protruded parts into the cavity of the abdomen. Nothing, but the absolutely gangrenous state of the intestines, should deter the practitioner from reducing it; the dark chocolate brown discolourations, with which it is often affected, generally produce no permanent mischief, and ought to be discriminated from the black, purple, or lead-coloured spots, which are the ordinary forerunners of mortification. The intestine is to be reduced before the omentum; and the portion nearest the ring should be first introduced.

After the operation, it is a point of great importance to ascertain with the finger, that the parts are all fairly and freely reduced into the abdomen. Recent adhesions of the intestines to the inside of the sac may be easily broken by the fingers. When the adhesions are old, the cautious employment of the knife is necessary; if they are sufficiently long to allow the intestine to be raised a little from the sac, they may be easily divided. The intestine and omentum remain destitute of their peritoneal covering, at the points, where such membranous adhesions were situated; but experience proves, that, after the reduction of the parts, no harm results from the circumstance, and the cure is not even retarded by it.\* When they are so short, that the inside of the sac and peritoneal coat of the in-

\* Scarpa, p. 158.

testines are in close contact, more skill is requisite, and the adherent parts of the sac must be cut off and returned into the abdomen, still adhering to the bowels. It is but right to state, however, that this practice is disapproved of by Scarpa: first, because this sort of adhesion, between the intestine and the sac, is most frequently situated in the neck of the latter part, where the object could not be effected without the greatest risk of wounding the spermatic cord; and, secondly, because the outer surface of the bowel would present, in the situation of the adhesion, a bleeding surface, that could not be safely reduced. Scarpa, therefore, recommends us merely to remove the stricture, and not attempt to destroy such adhesions.\*

When the adhesions are between the omentum, on one part, and the hernial sac, or bowel, on the other, Scarpa approves of Pott's† method, which consisted in dividing the omentum, as close as possible to the adhesion.

As soon as the intestine has been reduced, the omentum, if not diseased, is next to be replaced. However, when it is much indurated or thickened, a portion of it may be cut off. If any small arteries bleed, they are to be tied with a fine ligature. The practice of tying the whole omentum ought to be reprobated in the strongest terms. As Sir Astley Cooper judiciously remarks, it is extraordinary, that this custom should ever have prevailed. The very object of the operation is to remove from the omentum the stricture, derived from the pressure of a surrounding tendon; and, no sooner is this done, than the surgeon applies a ligature, which produces a more perfect constriction, than that which existed before the operation was undertaken.

When a portion of the omentum is mortified, and adhesions within the ring do not render the scheme impracticable, or unadvisable, the dead part is to be cut off, and the rest returned. This membrane is sometimes found converted into a large indolent fleshy mass, weighing two or three pounds. Here it should be cut away, and the bleeding vessels tied with fine silk ligatures.

In cases of large, old, adherent herniæ, it is best to remove the stricture without laying open the hernial sac, or at most, only the neck of it. The separation of the preternatural connexions is often extremely tedious and difficult. As Mr. Lawrence observes, the violence which must necessarily be inflicted, in executing this part of the operation, would be very apt to make the parts inflame. The extensive surface, which must be exposed by laying open the whole of a large hernial tumour; the risk of cutting the spermatic vessels, which often lie in these cases on the front of the lower part of the sac; the occa-

\* Op. cit. p. 161.

† Chir. Works, vol. iii. p. 299.

sional impossibility of keeping the returned part in the abdomen; the great dilatation of the ring, and the little hope of a radical cure; present numerous reasons in favour of the plan of only dividing the stricture. An incision, two or three inches long, is to be made in the integuments over the abdominal ring. The fascia, covering the sac, is to be exposed, and opened. A director may now be passed under the tendon, and a probe-pointed bistoury conducted along the groove to the part which is to be cut. In case of difficulty, the neck of the sac may be opened, and then the director introduced, &c.\*

#### MORTIFICATION OF THE INTESTINE.

The swelling, which was before tense and elastic, now becomes soft, doughy, emphysematous, and of a purple colour. Sometimes the parts now return spontaneously into the abdomen, and the patient survives only a few hours. In other cases, as Sir Astley Cooper has explained, the skin over the tumour sloughs, the intestine gives way, and the feces being discharged at the wound, the symptoms of strangulation soon cease. In this circumstance, the intestine becomes adherent to the hernial sac, the sloughs are thrown off, and thus an artificial anus is established, through which the feces are sometimes discharged during the remainder of life. Though such is the course of many of these unfortunate cases, it frequently happens, that the feces resume their former course to the rectum, and the artificial anus becomes unnecessary, and closes. I have seen several cases of this kind in St. Bartholomew's Hospital.

The degree of danger, which attends an artificial anus, depends upon the vicinity of the sphacelated intestine to the stomach; for, if the opening be in the jejunum, so little space is left for the absorption of chyle, that the patient dies of inanition.

If only a small slough has taken place, the intestine is to be reduced, without any particular proceeding.† Some writers recommend introducing a ligature through the mesentery, in order to confine the mortified part of the bowel near the wound. This proceeding, however, is quite unnecessary, as the disordered part of its intestine never leaves the neighbourhood of the abdominal ring, being kept in this situation by the adhesions of the adjacent parts to each other, in consequence of inflammation.

Even were the mortified part of the bowel not exactly opposite the ring, there would be no reason to fear any effusion of

\* See A. Cooper on Inguinal and Congenital Hernia, pp. 45, 46; and Lawrence on Ruptures, p. 269, edit. 4.

† See NOTE B.

its contents. It appears from the valuable observations of Petit,\* that the contents of the bowels, and even blood, when extravasated in the abdomen, do not become widely diffused; but are first kept from spreading about by the pressure of the respiratory muscles, and afterwards by the inflammatory agglutination of the surrounding parts.

When the whole cylinder of the intestine is mortified, all the various proposals, mentioned in the chapter on wounds of the belly, have been recommended. One practice has been that of cutting away the sphacelated part of the bowel, and bringing the two ends together, and keeping them so, by means of four stitches, made with fine thread or silk, and a common sewing-needle. Then a thread is to be introduced through the mesentery, for the purpose of keeping the ends of the intestine opposite the mouth of the hernial sac.

Mr. Lawrence most properly objects to this kind of practice; because by drawing the intestine out of the cavity, in order to remove the dead part, the adhesion behind the ring, on which the prospect of a cure entirely depends, must be entirely destroyed; and new irritation and inflammation must be unavoidably produced by handling and sewing an inflamed part. La Peyronie tried the plan of removing the dead part, and passing a ligature through the mesentery, so as to draw this membrane into a fold, and bring the two ends of the bowel nearer together. These were then kept near the ring by means of the ligature. La Peyronie's practice, however, ingenious as it may appear, has at present no advocates, and certainly, if it were only on account of the danger of its disturbing those salutary adhesions, which are formed between the living ends of the bowel and the adjacent parts, the practice ought to be condemned. Nor is Littre's treatment more to be commended, which consisted in retaining the superior extremity of the bowel, in the wound, and tying the lower, so as to aim entirely at the establishment of a permanent artificial anus.†

They have generally been the best surgeons in these circumstances, who have been content with little interference. If we merely make an outlet for the contents of the mortified bowel, and wait quietly, the sloughs will be cast off; the ends of the gut will be fixed near each other by the adhesive inflammation; the wound will often gradually close up; and the function of the intestinal canal be in time more or less perfectly re-established.

With regard to dividing the stricture, after the intestine has

\* Vid. two essays, sur les Epanchemens, in *Mém. de l'Acad. Royale de Chirurgie*, tom. ii. and iv. edit. 12mo.

† *Mém. de l'Acad. des Sciences*, an. 1700.



completely mortified, this measure is, in all probability, generally wrong, because it can now answer no rational purpose: and, besides giving unnecessary pain, must tend to disturb the completion of those salutary adhesions, by which the living part of the bowel is fixed to the wound. On this subject, I perfectly coincide with Mr. Travers. When the bowel is mortified, there is, in fact, no longer any stricture, the resistance which rendered it so, having been taken off by the collapse of the included gut.\* The incarceration has actually done its worst, and the parts acted upon by it being dead, are clearly susceptible of no further harm. Nor can the incision of the stricture now be necessary, on the ground that it will promote the evacuation of the intestinal contents, since, when the bowel has given way, before the operation, the sac and integuments are always loaded with fecal matter.† The propriety, however, of dividing the stricture, when the gangrenous mischief is but little advanced, is self-evident. When the intestine has mortified, but not burst, it is an important object always to make a free opening into it, so that the confined feces may have a ready outlet. The neglect of this practice, no doubt, has often deprived patients of all chance of recovery; for, while the contents of the bowels remain confined, no amendment in the symptoms can be expected.

When the gut has already given way, the propriety of facilitating the escape of the intestinal contents, by a free incision in the skin and sac, cannot be doubted.‡

In the different stages of mortified hernia, mild purgatives, and clysters, nourishing broths, soups, jellies, &c., wine, bark, and cordials, may all be of essential service. Poultices and fomentations are the best applications, till the sloughs have separated.

Scarpa§ published, a few years ago, some highly interesting remarks on the process employed by nature in repairing solutions of continuity in the intestinal canal, especially in cases of hernia with gangrene. After noticing the manner in which the excrement is discharged in these cases through the artificial anus, he observes, that though it is undoubtedly a disgusting infirmity, it does not preclude all hope of a radical cure, not even when a considerable portion of the intestinal canal has been destroyed by sphacelus. The recorded examples of such cures are abundant; and yet, says Scarpa, nothing has hitherto been written, which will serve to convey an exact idea of the

\* Travers on Injuries of the Intestines, &c. pp. 300, 301.

† Op. et loc. citato.

‡ See Pott's Works, vol. iii. case 21; and Travers on Injuries of the Intestines, &c. p. 308, &c.

§ Sull' Ernie Memorie Anatomico-Chirurgiche. Folio. Milano, 1809.

simple and admirable means which nature employs in accomplishing them. Surgeons have generally supposed, that, after the detachment of the dead parts, the two orifices of the bowel remain separated, and acquire adhesions to the margin of the external wound; that afterwards, in proportion as this contracts, they come gradually nearer together, and, in the end, touch each other so accurately, that the feces are capable of passing directly from the superior to the inferior portion of the gut. But this theory cannot satisfy those, who have attentively examined, in any cases of mortified hernia, the respective situations of the two orifices of the intestines, and their relation to the external wound. In fact, the two ends of the bowel are constantly found lying in a parallel manner, by the side of each other; the upper with its orifice open, and directed towards the external wound, by the feces, which issue from it; the lower, on the contrary, as it gives passage to nothing, always with a tendency to become less capacious, and retracted into the cavity of the abdomen. The contraction of the external wound cannot have the least effect in changing the direction of these two orifices, nor, consequently, in applying them to each other. Even supposing there were some natural tendency to this approximation, the upper orifice being wider than natural, and directed outwards, could never accurately coalesce with the lower one, which is shrunk and retracted within the belly. The feces then could never pass from one into the other, without the effusion of a considerable part of them outwardly, and in every instance, the result would be an incurable fistula, discharging the intestinal matter. Scarpa had an opportunity of examining the body of a young man, who, in consequence of eating a large quantity of indigestible food, died about ten months after having been operated upon for a congenital hernia, attended with mortification of the protruded bowels, at a period when he had recovered, with the exception of an occasional discharge of a very small quantity of feces from an inconsiderable fistulous opening. Scarpa also dissected two other cases; and, from all these, it appears that the breach in the intestinal canal is not repaired by the orifices of the upper and lower portions of the bowel re-uniting, coalescing, and running, as it were, into each other; nay, that the two openings meet at a very acute angle, and never lie laterally together. On the contrary, Scarpa's investigations satisfactorily prove, that a funnel-shaped membranous canal, (what he terms the *imbuto membranoso*,) composed of the remains of the hernial sac, constitutes the medium of communication between the upper and lower orifices of the bowel, which, in an early stage, become adherent to the peritoneum, about the neck of the hernial sac. The base of the funnel-shaped membranous cavity corresponds to the bowel,

while its apex tends towards the wound, or fistula. It farther appears, that the feces, in order to get from the upper into the lower part of the bowel, have to pass through the funnel-shaped cavity in quite a semicircular track; and that between the orifices of the bowel, directly opposite to the aperture between the cavity of the intestine, and that of the funnel-shaped membranous cavity, a considerable projection, or jutting angle, is formed, which makes a serious additional obstacle to the direct passage of the feces from the upper into the lower portion of the intestinal tube.\*

## FEMORAL OR CRURAL HERNIA

Often takes place in women who have had many children; seldom in young females; and still more rarely in men. In male subjects, the viscera generally escape through the abdominal ring, along the spermatic cord; in women, the protrusion is mostly below Poupart's ligament, on account of the smallness of the abdominal ring, its lower situation, its greater proximity to the pubes, and the more considerable extent of the crural arch in them, than in men. The crural hernia, whether in the male or female sex, forms in the cellular membrane, which accompanies the crural vessels under Poupart's ligament; it follows the inner edge of these vessels, and gradually descends to the bend of the thigh, between the sartorius, gracilis, and pectineus muscles.†

The tumour, in fact, takes place below Poupart's ligament, just on the inside of the femoral vein, and, being situated in front of the pectineus, is of course on the outside of the fascia lata. The variety, however, in which the hernia descends into the sheath of the crural vessels, is an exception to the latter statement. Many surgeons have imagined, that the hernial sac and the bowels usually lie over the crural vessels and trunk of the vena saphena, and sometimes betwixt these vessels and the anterior superior spine of the ilium: but as far as Scarpa's researches extend, this statement is not supported by a single accurate description of a crural hernia in the incipient state. It is true, however, that, when the tumour grows very large, and its fundus inclines parallel to the fold of the groin, it partly, or

\* It is but justice to mention, that some of the preceding facts were well known long before Scarpa published; especially the positions of the two portions of bowel with respect to each other, the diminished size of the lower continuation of the tube, and the ridge or angle between them. See particularly the Obs. of M. Pipelet, "Sur la Réunion de l'Intestin, qui a souffert Déperdition de Substance, dans une Hernie avec gangrene." This author gives us an accurate drawing of the manner in which the two parts of the bowel lie with regard to each other, after the cure. (Mem. de l'Acad. Royale de Chir. t. xi. p. 258.)

† Scarpa, *Traité des Hernies*, p. 203.

totally, covers the crural vessels, and even the crural nerve; but the femoral hernia never begins with descending over the crural vessels, and is never situated, in its early stage, between those vessels and the anterior superior spine of the ilium. Nor does the hernial sac at any time change its place from the inner to the outer side of the same vessels.\* The direction in which the parts protrude, is first downwards and then upwards, so that, in attempting the taxis, the surgeon should endeavour to reduce the viscera first backwards, and then upwards and inwards towards the navel; the abdominal muscles, Poupart's ligament, and the fascia of the thigh, being relaxed in the same way, as when an attempt is made to reduce a bubonocoele. Intestine is almost always contained in the sac; the cases in which the omentum protrudes by itself being unusual.

The anatomical circumstances, most worthy of the surgeon's notice, will be described in the account of the operation. With respect to the diagnosis, the tumour is generally much smaller than a bubonocoele, and lies so deeply in the groin, that, in the thinnest subject, its neck cannot be plainly felt. When the hernia is large, its neck is always deep, while its body and fundus assume an oval shape, being their greatest diameter across the bend of the groin. But, whatever may be the size of a bubonocoele, its shape is always pyramidal; the base, instead of tending towards the hip, constantly follows, in the male subject, the direction of the spermatic cord into the scrotum. Besides the symptoms common to hernia in general, the crural species, when it has attained a certain size, has some characters which are peculiar to it; as a sensation of stupor and heaviness in the thigh, and œdema of the leg and foot.† A femoral hernia, when small, is frequently mistaken for an enlarged gland; but though in the latter case, the appearance and feel of the tumour may not be sufficient to convey positive information as to the disease being hernia, the general symptoms are those by which we should be guided; and if they be of an urgent but ambiguous nature, it is better, as Mr. Lawrence observes, to use the knife for getting the requisite knowledge, than leave the patient to die without any attempt to save him. Cutting down upon a swelled gland will not be dangerous; and, if the case be a strangulated hernia, it will be the only means of saving life. I have seen more than one case, in which the patient was lost, in consequence of the disease being mistaken for a bubo, and no operation performed.

The general treatment of the crural hernia resembles that of other ruptures.

\* Scarpa, *Traité des Hernies*, p. 204.

† *Ibid.* p. 208.



In the operation for a strangulated femoral hernia, the incision through the integuments should commence from the point where the hernia protrudes; that is, at Poupart's ligament, a little nearer to the symphysis pubis, than the femoral vessels are; and it should be continued obliquely downwards and outwards.\* Any glands, which may lie over the hernia, should be avoided. The sac is still concealed beneath cellular substance, which is here much thicker than in a bubonocoele, and beneath aponeurotic fibres, which proceed from the femoral fascia, ascend obliquely over the front of the thigh, and are connected with the lower and external part of the tendon of the external oblique muscle. These fibres, which constitute what is frequently named the fascia propria, must be divided before the hernial sac can be exposed. The femoral hernia is on the outside of the fascia lata, except in a few instances, in which the parts enter the sheath of the femoral vessels. Hence, the operator should make his incisions cautiously; as the sac, which is usually very thin, lies immediately under the integuments, with the intervention of only a few tendinous fibres, which may be most safely divided, when a director, or probe, is placed under them.

The hernial sac is to be opened by means of a pair of dissecting forceps and a bistoury. The operator is to raise the part by taking hold of the cellular membrane attached to it, and is then to make a very small aperture by a superficial horizontal cut. Through this opening a director is to be introduced, and the surgeon may then safely divide the sac nearly as high as Poupart's ligament, and quite to the bottom of the tumour.

The next object is to divide the stricture. Formerly, the stricture was always supposed to be caused by the front edge of Poupart's ligament; and, consequently, its division was generally deemed the chief design of the operation. Le Dran, in operating for a crural hernia, very long ago observed, that the closest strangulation was not made by this ligament;† and when he divided the neck of the sac, no doubt he cut what Mr. Hey has since named the *femoral ligament*, the part generally producing the pressure on the strangulated viscera. Gimbernat is entitled to the honour of having first explained what part it is that really forms the strangulation.‡

The lower border of the aponeurosis of the external oblique muscle, as Mr. Lawrence remarks, has a broad insertion into the pubes; this attachment, which begins at the spine, runs

\* See Lawrence on Ruptures, p. 425. ed. 4.

† Observ. 57.

‡ See an Account of a new Method of operating for Femoral Hernia, by Antonio de Gimbernat. The original was first published at Madrid in 1793.

along the crista of the bone. Its position, therefore, in the erect state of the body, is nearly though not entirely horizontal: consequently, its two margins should be described by the epithets anterior and posterior; it being remembered, at the same time, that the former of these is rather higher, than the latter. That part of it, which is fixed to the spine of the bone, has the appearance of a firm, and somewhat round tendinous cord. Its insertion into the crista of the pubes is effected by means of a thinner portion, which gives to the tendon a clearly defined sharp edge at its posterior margin, and is more deeply situated, than the part attached to the spine of the bone.\*

It is this thinner, deep-seated, sharp-edged, posterior margin of Poupart's ligament, near the pubes, that occasions the strangulation in cases of femoral hernia, and requires to be divided in the operation. Hey terms it the *femoral* ligament. There is, however, another part, which has some share in producing the strangulation. Where the attachment of the fascia lata to the crural arch terminates, it forms a *semilunar fold*,† with the concavity turned towards the pubes, or opposite limb. This fold bends under the crural arch, so as to unite to the femoral ligament at its commencement, and consequently, it must contribute in some degree to the stricture.

Gimbernat has called the space beneath Poupart's ligament the *crural arch*. The anterior crural nerve always passes on the outside of the sheath for the femoral vessels, towards its external and posterior part. Before the external iliac artery enters, it sends off the epigastric. This vessel passes obliquely inward, between the crural arch and spermatic vessels. Immediately on the inside of the crural vein, there is a foramen, sufficiently distinct, almost round, at which many lymphatics enter. It is sometimes stopped up by a lymphatic gland; but the parts, which form the crural hernia, always pass through it, and, consequently, Gimbernat calls it the *crural ring*. It is bounded above and in front by the posterior edge of Poupart's ligament, and the semilunar or falciform process of the fascia lata; below and behind by the pubes; on the internal or mesial side by the thin border of the tendon; and on the outer lateral part by the crural vein. It is much smaller than might be imagined, since the large space under Poupart's ligament is elsewhere completely occupied, and also strengthened by an aponeurosis, which is derived from the iliac and psoas muscles, and extends from their surface to the crural arch, ending just over the crural vein.‡

\* On Ruptures, p. 387. edit. 4.

† This part has been excellently described by Mr. Lawrence, p. 392. edit. 4; and by A. Burns, in Edinb. Med. and Surgical Journ. vol. ii. p. 265, &c.

‡ Lawrence, op. cit. pp. 370, 371.

Having laid open the hernial sac, in the manner above recommended, the next object is the division of the stricture. Mr. Hey used to pass a director within the crural ring, on that side of the intestine, or omentum, which was nearest to the symphysis of the pubes, and with a probe-pointed bistoury cut that part of the ring, which he names the *femoral ligament*, directly upwards, a plan which answers very well in women, but would endanger the spermatic cord in men. Gimbernat recommends introducing a director into the ring, with its back towards the intestine, and its groove towards the symphysis pubis. Along the groove a narrow probe-pointed bistoury is introduced into the ring, and the internal edge of the femoral ligament divided as close as possible to its insertion into the pubes.

The direction in which Gimbernat cut the stricture, is now very generally preferred: the only danger attending it being that of injuring the obturator artery, in the occasional varieties, in which this vessel originates from the epigastric, and passes over the inner side of the neck of the hernial sac; a case that is calculated to happen in not more than one operation out of eighty.\* Were such an arrangement of the vessel to occur, however, I think a cautious and circumspect operator would be likely to feel its pulsation, and, at all events, by cutting slowly, and only a few fibres at a time, with a probe-pointed bistoury, avoid injuring it.†

#### EXOMPHALOS, OR UMBILICAL HERNIA.

Custom appears to sanction the extension of the terms, exomphalos, omphalocele, and umbilical hernia, not only to protrusions of the bowels through the opening of the navel, but to all other tumours of a similar nature, which present themselves any where in the vicinity of that aperture, and the majority of which actually takes place in the linea alba, either above or below the precise situation of the umbilicus. The first form of the disease, or that which consists of a protrusion of the bowels through the umbilical ring, is chiefly seen in the fœtus, or very young child; for, soon after birth, the navel, instead of being, as it previously was, the weakest point in the whole course of the linea alba, becomes the strongest, and the least capable of dilatation.

Whoever wishes to acquire an accurate knowledge of the disease now engaging our attention, must view it in its three principal forms; first, as it presents itself in the fœtus; secondly, as it is produced in an infant within a moderate period after birth; and lastly, with the peculiarities, which it exhibits, when it occurs in an adult subject.

\* See J. Cloquet *Récherches Anat. sur les Hernies*, p. 72; and Lawrence on Ruptures, p. 435. ed. 4.

† See NOTE C.

1. *Congenital Exomphalos.*

This is the case which sometimes affects the fœtus in utero, and of course exists at birth; the viscera protruding out of the umbilical ring itself, and passing into the cellular substance, which connects the vessels of the cord together. The present form of the disease may commence in any of the stages of gestation; for it is observed in the embryo, and in the fœtus which has not yet acquired its full size, as well as in that which is completely grown. It commonly presents a peculiar appearance, being opaque at its base, where it is covered by the integuments of the belly, and transparent at every other point, where it is merely covered by the cellular membrane of the umbilical cord. The cord itself appears as if it extended out of the apex of the tumour. The transparency of the external investment enables the surgeon to distinguish the hernial sac included in the triangular space, which is left between the separated umbilical vessels. The vein is always above, and the two arteries below, or on one side of the protruded viscera. The portion of the hernia, lying between the separated umbilical vessels, is furnished with two coverings, very distinct from each other, the external consisting of the cellular substance of the cord, and the internal being a production of the peritoneum, constituting a true hernial sac.\*

The hernial sac may contain a piece of small intestine, a portion of the liver, or where the swelling is of very large size, the liver, spleen, and some of the great intestines. In the fœtus from which fig. 1. plate x. of Scarpa's work was drawn, the hernial sac contained a portion of the great lobe of the liver, which extended in a conical shape between the umbilical vessels; but the whole of the liver is probably never displaced, a circumstance, which seems to be rendered impossible by the adhesions existing between this viscus and the diaphragm.

The principal cause of the congenital exomphalos, is referred by Scarpa to an imperfect development of the abdominal muscles, combined with a considerable size of the viscera of the belly, more especially, the liver. As the umbilical ring in the fœtus is the weakest point, the viscera under such circumstances must be very liable to protrude at it, and gradually make their way into the cellular substance, which connects the vessels of the cord together. He also conceives, that a protracted and difficult labour may contribute, if not to the production of the disease, at least, very seriously to its increase, after it has once commenced..

Children, born with umbilical herniæ, generally live but a short time, either because they are simultaneously afflicted with

\* Scarpa, *Traité Patrique des Hernies*, p. 323.



other malformations of a still more dangerous nature, as spina bifida, an incomplete formation of the cranium, weakness of the abdominal muscles, or considerable enlargement of the viscera, particularly the liver; or because the parts, forming the hernial protrusion, are in the majority of cases irreducible, by reason of their intimate adhesion to the neck of the hernial sac.\* Experience proves, however, that there are other cases, of smaller size, capable of reduction, and of a less complicated description, which sometimes admit of cure. At all events, every reducible case, whether large or small, whether complicated with other malformations and infirmities or not, should be carefully reduced, and means taken for hindering the protrusion of the parts again; for, when this indication is fulfilled, and the child continues to live, a radical cure naturally follows. For this purpose, after the reduction of the bowels, a conical graduated compress, covered by a circular quilted pad, is applied to the umbilical ring, and kept in its place with a roller. This practice, which is now recommended by all the best surgeons, is far safer than another method, which consists in attempting the cure with a tight ligature put round the root of the swelling. In the course of two or three weeks, the umbilical ring will frequently be closed. Prudence requires, however, that the apparatus should be worn somewhat longer.

## 2. *Exomphalos in Young Subjects.*

The true umbilical hernia, which is formed subsequently to birth, presents itself in children after the separation of the funis, and is generally attended with the following particularities:—The swelling is either of a round, cylindrical, or conical shape, with a circular base. No vestige of the cicatrix of the navel can be discerned upon it, except that near the apex, or upon one side of the tumour, a small portion of the skin seems paler and thinner than the rest. Underneath the common integuments, another covering is found, consisting of cellular substance, and of that delicate fascia, which is spread over the surface of the abdominal muscles. When this second investment is opened, the true hernial sac is seen, which is thin, semi-transparent, and, in every respect, similar to the rest of the

\* Scarpa, op. cit. p. 324. Ruysch never saw a case that was saved; which might perhaps be owing either to his meeting with the disease always in an aggravated form, or to the circumstance of his adopting only the palliative method of covering the swelling with a soft plaster; a means which, without a previous effectual reduction of the viscera, must have left the infant to certain death. He remarks: “Hunc affectum sæpius a me visum at nunquam curatum memini. Omnes enim ab utero ad tumulum delati fuere, 5to. 6to. 7mo. 8vo. aut 9vo. die.” Obs. Anatom. Chirurg. Obs. 71.

peritoneum. It usually contains a noose of intestine, and never, or but very rarely, omentum; a circumstance which Scarpa accounts for by the natural shortness of this membrane in young children.

If, while the umbilical ring is imperfectly closed, suitable pressure be not made upon the navel after the separation of the funis, the child's incessant crying, its straining excited by attacks of colic, and the injudicious custom of applying tight swaddling clothes, sufficiently explain how it happens, that the viscera protrude at the umbilical ring, which is at this period the weakest point of the abdomen. The bowels, in protruding, separate the cicatrix of the integuments from the obliterated extremities of the umbilical vessels, and afterwards gradually distend the same cicatrix, in such a manner, that its wrinkles are effaced, and it can no longer be distinguished from the rest of the integuments of the hernia.\*

The quickness with which the navel is closed after birth, and especially the retraction of the cicatrix by the umbilical ligaments, as the growth of the body proceeds, greatly promote the efficacy of bandages, and, in young children, facilitate the radical cure of this species of hernia. A disposition to such protrusions is very common during the first three or four months after birth; but moderate compression suffices for the removal of the swelling, and for keeping the parts reduced. In certain neglected cases, where nothing at all is done, and the disease is allowed to continue for three or four years, the regular employment of a bandage will even then prove successful, and be the means of accomplishing a permanent cure; nay, according to Desault, the disposition of the umbilical ring to contract in young subjects is so great, that the protruded viscera are sometimes forced back by it into their original situation, and a spontaneous cure is the result. The efficacy of pressure in producing this desirable change has been generally acknowledged by the most impartial and experienced surgeons, both of the last and present century. It is singular, however, that Desault, who knew what little assistance nature required, should entertain on this point a different opinion, and recommend the ancient practice of reducing the bowels, and then applying a ligature round the root of the swelling. This plan is found, not only to be more severe than compression, but more liable to be followed by a relapse; and there is great reason to believe, that the partial success which has attended it, has been chiefly owing to the pressure employed for the support of the cicatrix.

\* Scarpa, p. 331.

### 3. *Exomphalos of the Adult Subject, and Herniæ of the Linea Alba.*

J. L. Petit and Scarpa consider true exomphali, or those which occur through the umbilical ring itself, as peculiar to young subjects, in which sentiment they differ from Sir Astley Cooper,\* who represents the hernia as mostly happening through the navel itself. Monro† appears also to join in the latter opinion; for after observing, that, in infants, the protrusion generally happens through the centre of the navel, he remarks, that pregnant women are disposed to the disease, in consequence of the enlargement and weakness of the umbilical ring. Scarpa assures us, that a protrusion exactly at the umbilicus is very rare after childhood, and that if such a disease be sometimes noticed in adults, or even in old persons, the probability is, that it has existed in these subjects from their earliest infancy, though no attention may have been paid to the tumour while it was of small size, and free from inconvenience. He expresses his full conviction, that the hernia, which occurs in the umbilical region of the adult subject, and especially in females during the latter stages of pregnancy, does not protrude exactly through the navel, but only in the vicinity of it, that is to say, on one side or the other of it, or else above or below it. Occasionally, even two herniæ take place near the umbilicus in the same woman, neither of which actually protrudes through that opening.‡ Scarpa, therefore, classes the common exomphalos of adults with other herniæ of the linea alba, and is very particular in discriminating it from the true exomphalos, which is either congenital, or produced during the state of infancy. In adults, the protrusion happens more frequently above, than below the umbilicus; a fact accounted for by the upper half of the linea alba, from the ensiform cartilage to the navel, being naturally broader and weaker than the lower half, the recti muscles becoming situated nearer together as they descend from the navel to the pubes.

The true umbilical hernia, whether met with in the infant or the adult, has a circular neck, at the circumference of which the tendinous margin of the umbilical ring can be felt with the finger. Whatever may be the size of the tumour, its body always retains nearly a spherical shape; nor can any wrinkle of the skin, nor any thing at all resembling the cicatrix of the navel, be observed either upon the convexity or upon the sides of the swelling, the skin being merely a little paler and thinner

\* On Crural and Umbilical Hernia, p. 35.

† Morbid Anatomy of the Human Gullet, Stomach, and Intestines, p. 505.

‡ Monteggia, Institutz. Chirurg. p. 3. sez. 2. § 659.

at some points than others: on the contrary, in a hernia of the linea alba, the neck of the swelling is of an oval shape, like the fissure through which the protrusion has taken place. The tumour itself is also constantly of an oval form. When the finger is pressed deeply round its neck, the edges of the aperture in the linea alba are perceptible; and if the hernia be very near the navel, the umbilical cicatrix may be seen on one of the sides of the swelling, a sure indication that the viscera do not protrude through the umbilicus itself.\*

In a true umbilical hernia, the shape of the tumour varies according as the patient is fat or thin: in the latter case, it is free and pendulous; in the former, large at its basis, less prominent, and nearly hemispherical. The protruded parts naturally tend downwards, so that the opening into the abdomen is from the upper part, and not from the middle of the swelling; and as the rupture grows larger, this observation becomes more and more applicable.†

A large collection of hydatids within the liver, or upon its surface, sometimes give rise to a tumour at the side of the navel, which is liable to be mistaken for an exomphalos.‡

Many surgeons of considerable eminence have fallen into the error of supposing, that cases of exomphalos, particularly in adults, seldom have a hernial sac, though it is admitted by several of the same writers, that protrusions in the linea alba are constantly furnished with a peritoneal investment. As Mr. Lawrence observes, it does indeed frequently happen, in consequence of the peritoneum being closely connected to the inflected cicatrix of the integuments, that the distinction between the skin and the hernial sac cannot be traced on the front of the tumour, but it is even then most easily discerned at every other part of the circumference. The umbilical hernia is not only furnished with a true peritoneal sac, but possesses likewise a more superficial investment, derived from a condensation of the surrounding cellular substance. The coverings of this hernia, however, are frequently very thin. In old large cases, portions of the sac are sometimes absorbed, the viscera adherent to the integuments, and the intestine even strangulated in the aperture thus produced in the sac.§ Cases exemplifying these facts are now so abundant in the records of surgery, that it is almost superfluous to cite them. Sir Astley Cooper|| mentions instances, which fell under his own observation; and

\* Scarpa, op. cit. pp. 333-336.

† Lawrence on Ruptures, p. 450. edit. 4.

‡ Monro on the Morbid Anatomy of the Human Gullet, Stomach, and Intestines, p. 508.

§ On Ruptures, p. 452. edit. 4.

|| On Crural and Umbilical Hernia, p. 36.



the occasional absorption of the sac in large old exomphali, the passage of the intestines through preternatural holes, formed in the omentum, the very thin state of the integuments, and the situation of the bowels immediately under them, have been well explained by Lassus,\* who carefully describes the appearances in the dissection of a woman, who died from mortification of a large umbilical hernia. The knowledge of all these circumstances strongly indicates the prudence and necessity of using the utmost caution in opening an umbilical hernia, as the bowels may otherwise be wounded by the first stroke of the knife.

An umbilical rupture, in an adult, rarely contains intestine unaccompanied by omentum. Such a case, however, was operated upon by my friend Mr. Lawrence.† The transverse arch of the colon is the bowel mostly protruded, but the small intestines are also frequently found in the sac, and, in some unusual instances, the cœcum.

The exomphalos of the adult subject, happens with much greater frequency in women than men, a fact which is explicable by the consideration, that pregnancy has more influence than any other cause in bringing on the complaint. The swelling, indeed, generally becomes larger with every pregnancy; and, as the contents usually consist both of intestine and omentum, the disease mostly increases in size as the individual becomes fatter. Dropsical and corpulent individuals of both sexes are also frequently afflicted. The disease is by no means a common consequence of tapping in cases of dropsy; but facts of this kind are upon record, and Warner has related an example, in which the water was let out by puncturing a protuberance caused by the fluid at the navel, and an umbilical hernia followed, which became strangulated, and required an operation. It may be as well to add, that, in this instance, the paracentesis had been done with a lancet, and that in the description of the operation on the hernia, no mention is made of a peritoneal hernial sac, which, in an exomphalos thus produced, might really be absent.‡

Herniæ of the linea alba, when left to themselves, are much slower in their progress, than the true exomphalos. On account of their small size, they are frequently unobserved, especially in corpulent subjects, or when situated at the side of the ensiform cartilage. However, they bring on complaints of the stomach; habitual colics, particularly after meals; and, unfortunately for the patient, he may be troubled for a long while

\* *Pathologie Chir.* t. ii. p. 64. The skin could not be divided without opening some of the convolutions of the jejunum.

† *On Ruptures*, p. 455. ed. 4.

‡ See Warner's *Cases in Surgery*, p. 229. edit. 4.

with such disorders before their true cause is detected. On the other hand, a true umbilical hernia may be known from the earliest period of its formation, both by the changes which it produces in the cicatrix of the navel, and by the rapidity of its increase.

These two species of hernia require similar modes of treatment; but the cases which happen in the *linea alba*, *cæteris paribus*, are more difficult of cure than the *exomphalos*; a circumstance which is probably owing to the natural tendency of the umbilical ring to contract, when the hernia is properly hindered from descending, an advantage which does not belong to openings accidentally formed in the *linea alba*.\*

When an *exomphalos* is not kept reduced with a bandage or truss, but is allowed continually to protrude, its contents often acquire intimate adhesions to each other, and to the hernial sac, so as to form altogether one inseparable mass. Then the intestinal matter has sometimes a degree of difficulty in passing through that portion of the alimentary canal which is contained in the tumour. Frequently, indeed, it is detained there in sufficient quantity to cause obstruction, in which circumstance, the contents of the intestines accumulate in that part of the canal which is betwixt the hernia and the stomach. In this sort of case, vomiting is one of the earliest symptoms, the obstruction being of that description which the French have called "*l'étranglement par engouement*." The matter brought up from the stomach often has a fecal smell and colour; and the vomiting, which sometimes takes place without much effort, may be for a long while almost the only complaint.

In the mean while, the surgeon endeavours to reduce the hernia by the taxis; and occasionally the obstruction is removed with the aid of purgative clysters, small repeated doses of the sulphate of magnesia, and the application of ice, or cold lotions, to the tumour. In other examples, ten days or a fortnight may elapse, without the symptoms being urgent enough to demand an operation. According to one very experienced surgeon, this urgency commences as soon as the swelling begins to be painful and inflamed, the taxis being then no longer advisable, and further delay likely to be followed by mortification of the protruded intestine.† Several of the best practical writers concur in one important statement, which a prudent surgeon should constantly recollect, viz. that the *exomphalos* and *herniæ* of the *linea alba* are less subject to true strangulation, than the generality of other ruptures; but, that when it unfortunately takes place, the symptoms are more intense, and the

\* Scarpa, p. 340.

† Pelletan, *Clinique Chirurgicale*, t. iii. p. 89.

accession of gangrene more rapid, than in any other species of hernia. When in an exomphalos, or hernia of the linea alba, the omentum alone is strangulated, the symptoms are almost as urgent as when the bowel is in the same state. In the former case, however, there is generally only nausea, and if vomiting supervene, it is less frequent and violent, than when the intestine is incarcerated; and the stools are hardly ever entirely suppressed. The reason why the effects of strangulation of the omentum in an exomphalos, are more severe than in inguinal and crural herniæ, is referred by Scarpa to the proximity of the stomach.

When practicable, the exomphalos should be reduced, and kept from descending again by means of a well-constructed truss, the uninterrupted use of which, in young subjects, sometimes produces a radical cure. An excellent truss for umbilical herniæ was invented by Mr. Eagland, of Leeds, and described by Mr. Hey.\* Scarpa rightly insists upon the propriety of using, both for infants and adults, a pad, which is somewhat conical, and calculated for keeping the bowels completely returned, and the integuments in contact with the umbilical ring, or fissure in the linea alba. However, on account of the difficulty of applying a steel truss to ruptures near the ensiform cartilage, he recommends in these cases a pair of strong linen corsets, under which a compress is applied to the opening. In cases of exomphali, which are of enormous size, and irreducible, the only plan, which can be well pursued, with a view of lessening the inconveniences of the disease, and retarding its increase, consists in applying a suspensory.

When, in adult subjects, an operation is unavoidable, on account of the continuance of strangulation, and its effects, the method of proceeding is not materially different from that which has been recommended in describing the treatment of a strangulated inguinal or crural hernia. If possible, however, still greater caution is necessary, owing to the intimate connexion between the integuments and hernial sac, and the adhesions often existing between the latter part and the omentum. The frequent situation of the intestine under the omentum should also be remembered. Scarpa considers a longitudinal incision preferable either to a crucial division of the integuments, or to one in the shape of the letter T. When the sac is opened, the omentum commonly presents itself, or rather constantly does so in adults, unless the bowel happen to protrude through a preternatural opening in that membrane, in which circumstance, the gut will of course lie immediately under the

\* See his *Practical Obs.* ed. 3; also, plate 5, figs. 7, 8, and 9.

hernial sac. The introduction of a probe into the abdomen is often difficult, on account of the adhesions between the omentum and peritoneum forming the neck of the sac. After having got a probe, or director, into the opening, some surgeons divide the stricture a little way upwards in the course of the linea alba. Scarpa, however, recommends carrying the incision directly downwards, if the case be a true exomphalos, and laterally, when the protrusion has occurred in the linea alba.\* When an exomphalos is large and of long standing, the protruded viscera may have acquired so considerable a size, that their reduction becomes either impossible, or the attempt highly improper. Here, supposing no sign of gangrene to exist, the best plan is to be content with dividing the umbilical ring, and obviating the strangulation, without making any opening into the hernial sac. In the performance of this operation, Scarpa advises us to make a semicircular incision in the integuments, on the outside of the neck of the hernia, and then cautiously to divide the subjacent aponeurotic investment. We are next to insinuate a grooved director between the neck of the hernial sac and the umbilical ring, and cut the hard tendinous margin of the latter opening as freely as circumstances may require. If a director cannot pass easily between the sac and the ring, the nail of the left forefinger should be introduced between the neck of the sac, and the border of the tendinous opening, which is to be dilated without any injury of the sac itself. This being accomplished, a gentle attempt is to be made to reduce the portion of bowel and omentum nearest the ring. But, when adhesions hinder such reduction, the surgeon is to be content with removing the strangulation. Should it be found impracticable to make a suitable dilatation of the stricture, without cutting the neck of the hernial sac, this must be cautiously opened at the point where the umbilical ring has been already divided.† The preceding method appears much safer, than laying open an enormous swelling, and handling and exposing a large mass of viscera. I have seen one case, however, in which the bowel was strangulated by the pressure of a mass of diseased omentum; no dilatation of the ring was practised; and, though the tumour was large, it was deemed necessary to open the hernial sac.

#### CONGENITAL INGUINAL HERNIA.

This case differs from all other ruptures, in the circumstance of the protruded bowels being in immediate contact with the testicle, the tunica vaginalis serving as the hernial sac.

The old surgeons, apprized by repeated experience of the oc-

\* Scarpa, p. 365.

† Ibid. p. 362.



currence of these herniæ, in which the protruded bowels and testicle lay together in the cavity of the tunica vaginalis, were much embarrassed how to offer a plausible explanation of the mode, in which the viscera got into this singular situation; but, the general idea was, that these cases had all been originally common bubonocœles, and that the bowels afterwards passed into the cavity of the tunica vaginalis, in consequence of the ulceration, or bursting of the intervening parts. The French surgeon, M. Méry,\* however, should be excepted from this statement; for after making a very careful dissection of a congenital inguinal hernia, he came to a more correct conclusion than many later anatomists and surgeons, including even Mr. Samuel Sharp, the majority of whom, at the period when the *Critical Inquiry* was written, subscribed to the above mistaken notion.

Méry had discernment enough to find out, that the bowels did not descend into the tunica vaginalis by a destruction of the parts intervening between the testis and the contents of an ordinary bubonocœle; and he even suggested, that there must have been a process of peritoneum in the scrotum, communicating with the cavity of the abdomen, and ready for the reception of the viscera. However, he pursued the investigation no further, so that it remained for Haller, Hunter, and Pott, to enrich pathological science by a more ample explanation of the true nature of the congenital inguinal hernia, and of the way in which its origin is connected with the situation and descent of the testis in the young subject.

The origin of this species of hernia is as follows: until the approach of birth, the testes of the fœtus are lodged within the cavity of the abdomen, and situated immediately below the kidneys, on the forepart of the psoas muscles, by the side of the rectum, which bowel is larger in proportion to the capacity of the pelvis, than in the full-grown subject, and lies before the lumbar vertebræ as well as the os sacrum. The anterior and lateral surfaces of the testis are covered by reflected peritoneum, while posteriorly it adheres to the psoas muscle by means of cellular substance.† A little while before birth, generally in the eighth month,‡ but sometimes subsequently to this event, the testes descend through the abdominal ring, and then pass through a kind of membranous canal, which the peritoneum forms from that aperture into the scrotum. Thus, as they were already furnished with one peritoneal investment up in the loins, a second is acquired by their entering this canal, or

\* *Mém. de l'Acad. des Sciences*, ann. 1701, p. 282, obs. 3.

† See *Obs. on Certain Parts of the Animal Economy*, by John Hunter, pp. 2, 3.

‡ *Op. cit.* p. 9.

rather elongation of the peritoneum. The first covering, which is smooth, and everywhere closely adherent to the surface of the testis, constitutes the tunica albuginea; while the other, which is denser, and in front loose and unconnected, becomes the tunica vaginalis. "While the testis is descending, (says Mr. Hunter,) and even when it has passed into the scrotum, it is still covered by the peritoneum, exactly in the same manner, as when within the abdomen; the spermatic vessels running down behind the peritoneum there, as they did when the testis lay before the psoas muscle. That lamella of the peritoneum is united behind with the testis, the epididymis, and the spermatic vessels, as it was in the loins, and likewise with the vas deferens; but the testis is fixed posteriorly to the parts against which it rests, being unconnected and loose forwards, as while it remained in the abdomen. In coming down, the testis brings the peritoneum with it; and the elongation of that membrane, though in some circumstances it be like a common hernial sac, yet, in others, is very different. If we can imagine a common hernial sac reaching to the bottom of the scrotum, covered by the cremaster muscle; and that the posterior half of the sac covers, and is united with the testis epididymis, spermatic vessels, and vas deferens; and that the anterior half of the sac lies loose before all those parts, it will give a perfect idea of the state of the peritoneum, and of the testis when it first comes down into the scrotum. The testis, therefore, in its descent, does not fall loose, like the intestine, or epiploon, into the elongation of the peritoneum; but, slides down from the loins, carrying the peritoneum with it; and both that (the testis) and the peritoneum continue to adhere, by the cellular membrane, to the parts behind them, as they did when in the loins."\* Soon after the testes have arrived in the scrotum, the upper part of the peritoneal canal is gradually shut up and obliterated, by which change, all communication between the cavity of the peritoneum and that of the tunica vaginalis is effectually annihilated. The exact period of time, when the peritoneal canal closes, probably differs a little in different individuals, as the most correct writers are not entirely agreed about it;† but, according to John Hunter and Wrisberg,‡ both testes have usually got to the bottom of the scrotum in the ninth month, and the passage is closed. Sometimes, however,

\* Observations on Certain Parts of the Animal Economy, p. 10.

† Camper found the communication between the abdomen and tunica vaginalis open in 11 new-born infants out of 17, which he examined. Comment. Societatis Reg. Scientiarum, Gotting. 1778.

‡ See Observations on Certain Parts of the Animal Economy, p. 9, edit. 2; also p. 12, where it is observed, "It is seldom that any aperture remains in a child born at its full time."

the complete closure of the peritoneal canal, through which the testis descends, is certainly delayed for a greater or lesser space of time after the child is born, in which circumstance, if any of the bowels be forced into it, they become, of course, as long as they continue unreduced, an impediment to its further obliteration. The communication, between the cavity of the abdomen and that of the tunica vaginalis, then continues open, and the protruded bowel, and the testis, covered merely by its albuginea, lie together in one and the same sac, which is the tunica vaginalis itself. Such is the nature of the ordinary congenital inguinal hernia.\*

In a common rupture, the viscera push out with them a portion of the great bag of the peritoneum, which, thus forming one of the most regular investments of the displaced bowels, is called the *hernial sac*. But, in the congenital inguinal hernia, the sac, in which the viscera lie, is not thrust forth in this manner by the displaced bowels: on the contrary, it is a production of peritoneum originally formed, and placed ready for the reception of the testes on their descent from the loins, but, into which the bowels are sometimes accidentally propelled, before the passage leading into it from the belly is duly closed. The congenital inguinal hernia, therefore, differs from the generality of ruptures in having no hernial sac, formed and produced by the peritoneum being thrust forth from the belly by the displaced bowels themselves. There is, indeed, one very uncommon species of scrotal hernia, contained in the tunica vaginalis, yet included also in a common hernial sac, so that the protruded bowels neither lie in contact with the preceding membrane, nor with the albuginea. This particular case was first noticed and described by the late Mr. Hey: it seems to be formed, after the communication of the cavity of the peritoneum with that of the tunica vaginalis has been obliterated, but previously to the closure of the passage lower down.†

It is curious, that the above-described peritoneal canal, forming in the fœtus a communication between the abdomen and the scrotum, should sometimes remain open a considerable time after birth, without being attended with any hernial protrusion; a fact, fully authorizing the inference, that we should look to other circumstances, besides the descent of the viscera, for an

\* "It should be observed, however, that the hernia congenita may happen, not only by the intestine falling down to the testis before the aperture of the sac is shut up, but perhaps afterwards: for, when the sac has been recently closed, it seems possible enough that violence may open it again." Hunter, in *Obs. on Certain Parts of the Animal Economy*, p. 15.

† Hey's *Practical Obs. in Surgery*, p. 221, &c. Another case of the same nature is described in Sir A. Cooper's *Work on Inguinal and Congenital Hernia*, p. 59.

explanation of the cause by which the closure of this canal is deferred to so late a period. In consequence of the passage being thus left unobliterated, for a great length of time, however, a rupture of precisely the same nature as the congenital inguinal hernia may first happen long after birth; while the instances, in which this conformation exists, unaccompanied with any protrusion, amount to an unequivocal proof, that this species of rupture essentially requires for its production, not only a pervious state of the peritoneal canal, but also the operation of a cause, capable of determining the bowels to fall down into the passage.

The delay of the testis at the ring, and the consequent dilatation of the corresponding portion of the peritoneal canal, ought probably to be regarded as one of the most common predisposing causes of congenital inguinal hernia: Sandifort\* inclines to this sentiment delivered by Richter, which has still higher support in the authority of John Hunter, to whom the suggestion perhaps strictly belonged; but an exception must be made of those instances, in which the hernia appears to be the consequence of an adhesion between the bowels and the testis previously to its descent. Nor can Richter's explanation be applicable to cases, where the viscera protrude into the tunica vaginalis, while the testis remains within the abdomen, never having reached the upper part of the peritoneal canal at all. At the same time, it may be conceived, that in this particular example, the protracted descent of the testis may lessen the tendency of the upper portion of the tunica vaginalis to close at the usual period, and thus become a predisposing cause of the protrusion of the bowels.†

Another fact, very necessary to be understood, is, that the common forms of this disease are seldom produced by the bowel insinuating itself into the passage simultaneously with the testis. Before birth, the small intestines are but little distended, and, in the absence of respiration, they can suffer no compression from the diaphragm and abdominal muscles. Under these circumstances, it is difficult to imagine, how they can protrude from the cavity of the belly; and, in fact, notwithstanding the use of the expression, "congenital," the disease is hardly ever observed in infants directly they are born, but makes its first

\* "Nullatenus tamen negandum est, hærentem nimis diu in fissura obliqui externi et apertura canalis, testem, has partes sic dilatare, ut postea vix debito modo sese claudere possint, sed ostium productionis peritonæi aptissimum maneat quod intestina, vel minimo nisu eo versus depulsa, admitat." *Icones Herniæ Inguinalis Congenitæ*, p. 22.

† "The descent being thus early, and the passage being almost immediately closed, are the principal means of preventing the hernia congenita." *Obs. on Certain Parts of the Animal Œconomy*, p. 9.



appearance afterwards. The child only brings with it into the world a state of parts, which is favourable to the occurrence of the complaint; or, in plainer terms, it is born with a free communication between the cavity of the peritoneum and that of the tunica vaginalis. When, says Mr. Hunter, the testis has remained in the cavity of the abdomen beyond the usual time, it is impossible to say, whether the disposition for closing up the passage is in any degree lost, or not; but, when it comes down after birth, we can easily suppose a portion of intestine, or epiploon, is more likely to descend, and prevent the closure of the mouth of the sac, than before the child was born, when certain actions had not taken place.\*

Some congenital herniæ have been known to take place, for the first time, as late as the ages of twelve, fifteen, twenty, and even thirty. Probably, in several of these examples, the testicle had remained all this while within the abdominal ring;† and without descending into the scrotum;‡ and when it did descend, the bowels followed it.

One accidental circumstance, however, may make a rupture strictly congenital; or, I should rather say, it is now proved by the observation of a large number of cases, that there are two states, which are conducive to this less frequent event. Before birth, either a part of the intestine or omentum, may adhere to the testis previously to its leaving the abdomen, so that when this gland descends into the scrotum, the connected bowel necessarily follows it: or the peritoneum, investing the spermatic vessels, may send off a short fold, resembling a ligament, to the adjacent part of the ileum, or cœcum, by means of which membranous fold, the bowels, on the right side, where congenital herniæ are more frequently noticed, are drawn from their natural situation in the groin, when the testis passes into the scrotum.§

\* Obs. on certain Parts of the Animal Œconomy, p. 16.

† The descent of the testis is very slow, when not completed before birth; the process indeed often occupies years, and even then the testis sometimes never reaches the lower part of the scrotum. According to Mr. Hunter, the completion of the descent, in retarded cases, most frequently happens between the ages of two and ten, while the person is young and growing, and is seldom delayed beyond the age of puberty. *Op. cit.* p. 16.

‡ In one patient, aged 20, both the testes, which till then had been concealed in the abdomen behind the rings, were suddenly expelled from these openings, in a violent exertion made to leap over a wide ditch: their issue was soon followed by a descent of the bowels. See *Dic. des Sciences Medicales*, t. xxi. p. 161. Mr. Hunter knew a rupture happen in a man thirty years old, where the testes had not even got into the ring. *Obs. on Animal Œconomy*, p. 17, edit. 2.

§ Wrisberg, *Observat. Anatom. de Testiculorum Descensu*, p. 48. Sandifort has also detailed a case, in which the appendicula vermiformis, which was adherent both to the testis and the sac, had drawn down the cœcum,

The formation of such adhesions between the bowels and testis before birth, may also sometimes prevent, or at least seriously retard, its descent. In an infant, which had only one testis in the scrotum, and died a few hours after birth, the opposite one was found close to the ring, and connected to the omentum by three slender filaments.\* In the body of a very aged subject, the left testis, which was of its natural size, was found situated between the iliacus internus and psoas muscles, an inch from the superior opening of the peritoneal canal. The epididymis, which was well formed, adhered to the sigmoid flexure of the colon by means of a whitish, strong, round filament.†

The congenital inguinal hernia cannot be divided, like bubonocoeles, into *external* and *internal*; but must evidently always be *external*, since the neck of the tunica vaginalis invariably corresponds to the point, at which the spermatic cord passes under the border of the transversalis muscle. The tunica vaginalis has also the same anatomical relations as the sac of a common inguinal hernia; like it, passing completely through the inguinal canal, from one end of it to the other, and lying on the front of the spermatic cord. Of course it passes through the separation between the lower fibres of the obliquus internus, and the principal origin of the cremaster muscle. On coming out of the ring, it still adheres closely to the spermatic cord, and is enclosed in the muscular and aponeurotic expansion of the cremaster, which accompanies it to the bottom of the scrotum. As the tunica vaginalis, containing the protruded viscera, enters the inguinal canal beyond the point, at which the spermatic cord crosses the epigastric artery, it is clear, that, by following precisely the direction of the cord, it must also cross the artery, and push it from the external to the internal side of the ring. The epigastric artery, therefore, is constantly displaced, in the congenital inguinal hernia, just as it is in the common *external* bubonocoele.‡

A congenital inguinal hernia is, at first, generally an enterocoele, the omentum in young infants being too small and short to protrude under ordinary circumstances down into the scrotum. However, when the testis, previously to its descent, becomes accidentally adherent to the omentum, the disease may

and part of the colon, and ileum. *Icones Herniæ Inguinalis Congenitæ*, p. 12. Wrisberg saw two other strictly congenital ruptures on the right side, both induced in a similar manner. *Op. supra cit.* pp. 24, 25.

\* Wrisberg, *Comment. Societ. Scient. Goetting.* 1778. p. 43, &c.

† Jules Cloquet, *Récherches sur les Causes et l'Anatomie des Hernies Abdominales*, Obs. 6. t. 24. 4to. Paris, 1819.

‡ Scarpa, *Traité Pratique des Hernies*, p. 74.

be from the first, and in the youngest subject, an epiplocele;\* and, in other cases, where no such connexion exists, the omentum may afterwards descend into the hernial cavity. As Sandifort remarks,† not only has intestine alone been found in this species of hernia, but in a more advanced age, the omentum, either with, or without, a portion of the bowels, has formed the contents of the tumour.

The most important symptom, by which a congenital inguinal hernia may be distinguished from a common scrotal rupture, is the situation of the testis, which, in the latter disease, can always be plainly felt towards the lower and back part of the tumour. But, in a congenital hernia, if the protrusion be at all considerable, the testis cannot be felt while the bowels are down. When we hear, also, that the patient has had the complaint from his earliest childhood, we have strong reason for suspecting the case to be of the congenital kind. But, when such intelligence is communicated to us, we are not, without further consideration, to pronounce the disease positively to be congenital rupture; for, experience proves, that every hernia in a child is not invariably of this description. A bubonocoele has been seen in a child only fourteen months old, and, what is also worthy of notice, the case was strangulated, and required the operation.‡

According to Monro, the tumour, formed by a congenital inguinal hernia, passes out perpendicularly from the abdomen; because, in a new-born infant, the spermatic cord does not pass obliquely through the parietes of the abdomen, as in the adult, but directly through them.§

Scarpa adverts also to the following circumstances, the recollection of which will be of great service in distinguishing a congenital from a common inguinal hernia:—1. When this last case, whether external or internal, passes into the scrotum, it cannot descend beyond the point, where the spermatic vessels enter the testicle. Here the cellular membrane of the spermatic cord terminates, and here the hernial sac must necessarily be stopped. On the contrary, in the congenital hernia, the viscera may descend lower than the testicle, with which they are in immediate contact, and may at length even occupy its place, pushing it upwards and backwards.—2. In a congenital hernia,

\* Thus Mr. A. Burns found the omentum, which had previously adhered to the testes, and been dragged from the abdomen along with that organ, in the congenital hernia of a new-born infant. See Monro's *Morbid Anatomy of the Human Gullet, Stomach, and Intestines*, p. 511. 8vo. Edinb. 1811.

† *Icones Herniæ Inguinalis Congenitæ*, p. 24.

‡ See Lawrence on Ruptures, p. 65, edit. 3.

§ Monro on the *Morbid Anatomy of the Human Gullet, Stomach, and Intestines*, p. 510.

the viscera usually pass from the groin down into the scrotum in a very short space of time, and, as it were, precipitately; but, in a common inguinal hernia, the protrusion is generally slower and more gradual. The reason of this difference is sufficiently manifest: in the former case, the descent of the testicle, and the ready-formed tunica vaginalis, have opened and prepared the course, which the viscera are to follow as they protrude; while in the latter, the hernial sac can only get into the scrotum by gradually elongating the layers of cellular substance, which connect it to the surrounding parts. This fact, says Scarpa, is so generally admitted, that experienced practitioners consider the quickness, with which the bowels have descended from the groin into the scrotum, a characteristic mark of a congenital scrotal hernia.\*

Sometimes the testis is so enveloped in the omentum, that the disease may be, and indeed has been, mistaken for a sarcocele.†

The viscera, included in a congenital hernia, but more especially the omentum, are frequently adherent to the testis; a complication attended with serious inconvenience:‡ for, whenever an endeavour is made to reduce the hernia, the testis is forcibly drawn up to, or even within, the abdominal ring; the patient is subjected to a good deal of pain, the hernia cannot be effectually returned, and the use of a truss is inadmissible. It was a very slender connexion of this sort, which made the rupture of the celebrated Zimmerman irreducible, and caused him such annoyance, as induced him to submit to a fatal operation. The omentum, often thickened, and changed into a firm cylindrical mass, may also adhere either to the sac, or the epididymus, or both,§ and a similar connexion is often remarked between the testis, the sac, and the intestine.|| Sometimes the testis remains at, or within the abdominal ring, while a piece of intestine lies in the scrotum.¶ This is another case, in which a truss cannot be rightly employed. When the testis lies in the groin, it may also be so covered and concealed by the protruded bowel, or omentum, as not to admit of being plainly felt, in which circumstance, it is very liable to be injured, either in the taxis, or an operation with the knife. The possibility of a strangulation happening, before any further descent,

\* Scarpa, *Traité Pratique des Hernies*, pp. 75, 76.

† Méry in *Mém. de l'Acad. Royale des Sciences de Paris*, An. 1701. p. 279.

‡ Meckel, *Tractatus de Morbo Hernioso Congenito Zimmermani*.

§ J. Cloquet, *Récherches sur les Causes et l'Anatomie des Hernies Abdominales*, Obs. 78, p. 102. 4to. Paris, 1819.

|| Sandifort, *Icones Herniæ Inguinalis Congenitæ*, p. 15.

¶ See Pott's *Chirurgical Works*, vol. ii. p. 117, edit. 1808.



either of the testis or bowels, has taken place, is proved by several facts upon record. Thus Reichel saw a boy, about four years old, whose scrotum was yet empty, in whom the ileum was strangulated, with the testis at the abdominal ring;\* and Pelletan records a case, where the testis lay at the upper and outer part of the ring. The rupture was always easily reducible, and when the patient was sixteen, the bowels, after being returned, did not protrude again till he was nineteen years old. This event was attended with some pain, but still the hernia admitted of being reduced with ease. One day, however, it could not be got up again, and became strangulated:—but, on the following day, the bowel was reduced in the Hôtel Dieu. The patient felt some relief; but the pain did not entirely cease, and the vomiting continued; the testis being prominent at the external side of the ring. Although the hernia, after falling down and being once more reduced, did not make its appearance again, the patient got worse and worse, and died on the fourteenth day. Before death, the prominence of the testis was remarked to be greater than usual. On dissection, besides the general marks of inflammation in the abdomen, a noose of the ileum was found strangulated by the pressure of the testis within the ring.†

When, in the instance of a protrusion of the intestines into the upper part of the tunica vaginalis, the testis happens to be nearly or quite on the outside of the ring, the occasional employment of gentle pressure is recommended, in order to promote the descent of that gland into the scrotum. According to Richter, this is the only chance of preventing the rupture from becoming strangulated, and when it fails, (supposing the symptoms should be urgent,) an operation is the only resource.‡ Here the knife must be used with particular circumspection, lest the testis be injured; an accident, of which there would be great risk, if that body were adherent, as it frequently is, to the protruded bowels. In operating upon a patient in the foregoing state, it does not appear to me, (though it did so to Richter,) that our aim should be, to make the testis pass either further down, or back again into the ring, for the purpose of enabling the patient to wear a truss. But if we are obliged to use the knife, I conceive, our interference should be limited to the great indication of liberating the strangulated viscera, and effecting their reduction; for, when their constriction is removed, the immediate source of danger is obviated, and nature undisturb-

\* Ludwig. *Advers. Medic. Pract.* vol. iii. pp. 736, 737.

† See Pelletan's *Clinique Chir.* tom. iii. p. 394.

‡ *Anfangsgr. der Wundarzn.* b. v. p. 436.

ed will best do the work of bringing the testis down into the scrotum.

These remarks apply to cases, in which an operation is undertaken; and, were we have it in our power, at all events, by means of it to remove the stricture. But things are very different when the knife is not used; and, perhaps, then, certain modes of proceeding with respect to the testis may be right and necessary, in order to liberate the hernia, without the hazard of an operation, which modes would be highly wrong, were the risk of such operation to be encountered. Thus, cases present themselves, where the testis lies so far within the ring, that it can scarcely be felt externally; yet, gradually, or from some very slight cause, it protrudes in a more sudden manner, and immediately brings on symptoms of strangulation: here I should not find fault with the practice of trying to get rid of the strangulation by pressing the testis back again; a thing, which Richter says can generally be accomplished.\*

The upper part of the peritoneal canal is generally closed and obliterated, soon after the passage of the testis into the scrotum. This disposition of the canal to close is also sometimes evinced in cases of hernia. Several contracted points may occasionally be remarked in the neck of the sac of a congenital hernia, and even be the cause of strangulation. In such circumstances, the surgeon must take especial care to lay open the hernial sac its whole length up to the ring, in order to set the parts free, and this being done, there will frequently be no necessity for dilating the ring itself.

The treatment of a congenital inguinal hernia is to be conducted on the same general principles which apply to other ruptures. A radical cure is often easy of accomplishment; for, after the viscera are reduced, the passage, or communication between the abdomen and scrotum, has a natural tendency to close, and in young persons will always do so, provided care be taken to prevent the bowels from descending again, by the regular and uninterrupted use of a well-made truss. If the patient be young, the cure may even be completed in the course of a few weeks. This facility of cure, however, diminishes as the individual grows older, and, after the adult age, little expectation can be indulged, that the patient will ever recover so as to enjoy security, without the constant employment of a truss. As Mr. Pott has correctly stated, a piece of intestine, or omentum, may get pretty low in the sac, while the testis is in the groin, or even within the abdomen. In these cases, the application of a truss would be highly improper; for in the latter, it might prevent the descent of the testis from the belly into the scrotum; in the

\* *Anfangsgr. der Wundarzn. b. v. p. 437.*

former, it must necessarily bruise and injure it, give a great deal of unnecessary pain, and can prove of no real use. Such bandage, therefore, ought never to be applied, unless the testis can be fairly felt in the scrotum, after the bowels are replaced.

In young subjects, in whom no congenital hernia actually exists, but one or both testes have not yet passed the ring, their descent should be watched, because it is a period when a tendency to a hernial protrusion must prevail. Here, as soon as the testis has got some way below the ring, a truss, of a construction that will not hurt the testis, should be applied, with a view of preventing a hernia, and aiding nature in the process of obliterating the communication between the addomen and scrotum. When, however, a hernia takes place in a patient whose testis has not descended, and whose age makes it doubtful whether it ever will descend, or such descent be advantageous, Mr. Hunter thinks a truss should be applied immediately the bowels are reduced.\*

In the operation, the testis will often be found between the intestine and omentum; and, after their reduction, it will be left quite bare in the exposed cavity of the sac. As it is a part very sensible, and prone to inflammation, it should never be unnecessarily handled and disturbed. Indeed, I should here recommend surgeons to listen to the advice of Mr. Lawrence, who says the hernial sac should never be laid open below the upper part of the testis, unless the freeing of the protruded bowels from adhesions were to render a more extensive exposure of the cavity of the tunica vaginalis indispensable.†

The sac of a congenital rupture is frequently very thin; sometimes so thin, and at the same time so firmly adherent to the skin, that both parts are opened together by the same stroke of the knife.

Pott and Wilmer believed, that the congenital inguinal hernia was more subject, than a common bubonocoele, to that kind of strangulation, which is caused by the neck of the hernial sac. Out of five congenital herniæ which Wilmer operated upon, three were strangulated in this way, and not at all by the ring. Sandifort‡ remarked the same thing in the body of a young man who had died of a strangulated congenital hernia: the operation having proved ineffectual, in consequence of the surgeon

\* Obs. on certain Parts of the Animal Economy, p. 17.

† Lawrence on Ruptures, p. 502, edit. 4. In an example related in a modern work, delirium, and a severe inflammation of the testis, with a large abscess on each side of the scrotum, followed an operation for congenital hernia. As there were some slight adhesions between the testis and the protruded small intestine, it had been necessary to lay open the tunica vaginalis. See Pelletan's Clinique Chir. tom. iii. p. 84, &c.

‡ Museum Anat. Acad. Lugdun. vol. ii. tab. 91, 92.

neglecting, as he dilated the ring, to divide the neck of the hernial sac, which was the principal seat of the strangulation. In a case, dissected by Dr. A. Monro, junior, there was a stricture in the middle of the peritoneal canal; and a part of the omentum, which descended below the constriction, was of unnatural bulk.\*

The parts are often girt by a contraction of the hernial sac, not only where it communicates with the abdominal cavity, but also in other situations, where we should not have expected this occurrence.† Such constrictions occasionally form even towards the lowest part of the sac: a case indeed uncommon; but, when it does happen, likely seriously to embarrass a surgeon not apprized of its possibility. In this manner, the inferior part of the sac of a congenital hernia may become completely shut up, so as to leave the tunica vaginalis a distinct and separate cavity. When this separation is accomplished, the bowels are no longer contained in the same cavity with the testis; and the rupture, which was at first congenital, is now changed into a case not very different from a common bubonocoele. This observation, with a case illustrative of it, I find in the work of a modern writer, who has availed himself of the extraordinary opportunity of dissecting nearly six hundred subjects afflicted with herniæ.‡

In operating upon congenital herniæ, therefore, we should be aware, that the protruded bowels may be strangulated by a contraction of the neck, or even of the body, of the hernial sac, while the abdominal ring itself may have no share in producing the evil. Where, however, it is requisite to dilate this opening, the incision may always be made with perfect safety, either directly upwards, or upwards and outwards; the displacement of the epigastric artery to the inner side of the neck of the hernia being regular, and constant in its occurrence, for reasons already detailed.

Sometimes an aqueous fluid collects in the sac of a congenital hernia, either with or without a protrusion of the viscera, forming a true hydrocele of the tunica vaginalis, but attended with the peculiarity, that the water can be pressed back into the abdomen. According to Sir A. Cooper, the nature of the case may be ascertained by returning all the contents of the tumour into the cavity of the abdomen, when the patient is in a horizontal posture, and then, on putting the finger against the abdominal ring, and letting the patient stand up, the water will fall

\* Monro's Morbid Anatomy of the Human Gullet, Stomach, and Intestines, p. 509.

† Lawrence on Ruptures, p. 502, edit. 4.

‡ J. Cloquet, *Récherches sur les Causes et l'Anatomie des Hernies abdominales*, p. 60. Obs. 37. 4to. Paris, 1819.



into the scrotum; if the pressure of the finger be now diminished, and the patient cough, the intestine and omentum will be felt falling down into their former situation. In young subjects, the fluid is in the end generally absorbed, and no operation is necessary on its account.

The pervious state of the peritoneal canal, and the descent of the bowels into the same cavity with the testis, do not render the patient altogether exempt from the possibility of the peritoneum becoming dilated into a hernial sac through the abdominal ring; thus a double rupture may be produced on the same side \*

#### HERNIÆ OF THE CÆCUM AND COLON.

Herniæ of the fixed parts of the cæcum and colon, have a strong claim to separate consideration, their differences from common herniæ being, on various accounts, remarkable, and highly interesting in practice. In the first place, the nature of the adhesions, which occur in certain herniæ of the large intestines, is such as to merit the serious attention of the practical surgeon; for they have no analogy to the adhesions, which are met with in other herniæ, and are the result of adhesive inflammation, for they are actually composed of the same bands, which naturally fixed the bowel in the cavity of the abdomen, and have been carried with it into the scrotum. The importance of being aware of this fact is self evident; for, were such adhesions to be regarded and treated in the same way as those connexions, which arise from the effusion and organization of coagulating lymph, and which are not unfrequently divided with the scalpel, dangerous and even fatal consequences might arise.

*Natural adhesions* are not observed in all scrotal herniæ, but only in those of the large intestines, that is to say, in scrotal ruptures on the right side, formed by the cæcum, the appendix vermiformis, and the beginning of the colon; and in such herniæ on the left side as contain the sigmoid flexure of the colon. In the natural state, the cæcum and the ascending colon are firmly fixed in the right ileo-lumbar region, by means of two folds of the peritoneum, one of which is attached to the os ilium; and the other, to the external margin of the psoas muscle.

In dissecting scrotal herniæ of the right side, formed by the cæcum, the appendix vermiformis, and commencement of the colon, Scarpa remarked, that these bowels had drawn after them into the scrotum the layer of the peritoneum, by which they were naturally fixed in the right ileo-lumbar region, so that this portion of the great bag of the peritoneum contributed to the formation of the hernial sac, on opening which, the intestines

\* Sandifort, Obs. Anat. Pathol. lib. 1. p. 71.

were seen connected to its parietes, just as they were in the cavity of the abdomen previously to their displacement.

By repeated examinations, he traced, as it were, the progress of nature in the formation of these herniæ. He found, in a male subject, fifty years of age, an inguinal hernia of the right side, as large as a hen's egg, containing merely the fundus, or unfixed portion of the cæcum. The fold of peritoneum, which fixes this bowel in the lumbar region, had already undergone very considerable displacement, having descended to within an inch of the abdominal ring; but, as it had not yet got into the hernial sac, the intestine was easy of reduction. In another individual, he found the same species of hernia advanced a degree further: the whole of the cæcum was contained in the hernial sac, together with the appendix vermiformis, and beginning of the colon. The external side of the neck of the hernial sac was evidently formed by the portion of peritoneum, which in the natural state invests the ileo-lumbar region; the cæcum and beginning of the colon were attached to this part of the parietes of the sac by the same duplicatures of peritoneum which naturally bind them down in the right flank. An adhesion of a similar nature united the appendix vermiformis to the portion of hernial sac, corresponding to the little mesentery of this appendix. It was impossible to reduce the cæcum and beginning of the colon completely, because the above-described adhesions reached about two inches below the abdominal ring. In a third subject, a man, sixty years of age, who had died with a very large old scrotal hernia of the right side, Scarpa found in the hernial sac not only the cæcum and beginning of the colon, but also the extremity of the small intestines; all these viscera together composed a considerable mass, by which the scrotum was distended. The duplicatures of peritoneum, constituting the natural attachments of the cæcum and beginning of the colon, were also manifestly seen forming a part of the hernial sac, and extending to the peritoneal coat of these viscera, so as to constitute a natural adhesion. The fundus of the cæcum was free and unattached, as it naturally is in the cavity of the abdomen: it could also be made to reascend a little towards the ring; but all the rest of this bowel, as well as the beginning of the colon, was so intimately and extensively adherent to the parietes of the hernial sac, that it was quite impracticable to reduce it. The fundus of the cæcum, that is to say, all its unattached portion, had undergone considerable enlargement, and descended to the bottom of the scrotum. This is what happens in all herniæ of this description, in consequence of the accumulation of fecal matter in that intestine. The right colon was also drawn considerably towards the groin, as well as the fold of peritoneum, serving for its attachment.

Natural adhesions of the large intestines to the hernial sac, may also take place in a scrotal hernia of the left side, when the protrusion consists of that portion of the colon which is naturally fixed in the left ileo-lumbar region. The left lumbar colon is attached on one side to the mesocolon, and on the other to the layer of peritoneum investing the ileo-lumbar region, by means of broad, membranous duplicatures of peritoneum, which accompany the bowel to the place where it crosses the iliac vessels, as it passes towards the pelvis to form the commencement of the rectum. When the portion of the colon, which is situated above the iliac vessels, descends into the scrotum, the hernial sac will necessarily consist of the layer of peritoneum lining the ileo-lumbar region, and consequently of the folds of this membrane, which serve to fix the bowel in its natural situation. In this species of hernia, as well as in that which is composed of the cœcum, a portion of the great intestine will always be found connected to the hernial sac, by the same bands which fixed it in the cavity of the abdomen.

When a preternatural looseness of the fold of the peritoneum, which fixes the cœcum, is conjoined with a weakness of the aponeurosis of the right external oblique muscle, a protrusion of that bowel is liable to happen. The abdominal muscles and diaphragm make equal pressure upon all the viscera of the belly; but, in the circumstances suggested by Scarpa, the cœcum and beginning of the colon will be more disposed to yield to this pressure, and protrude, than any other part of the intestinal canal. Large accumulations of indurated fecal matter in the cœcum, may also materially increase this tendency to displacement. A hernia of the cœcum may sometimes be consequent to that of the ileum, which having first descended into the scrotum, successively draws after it the cœcum with its appendix, the beginning of the colon, and the membranous folds constituting the attachments of these viscera. When a hernia of the cœcum is congenital, Scarpa believes, that it is produced by an adhesion, which the testis contracts with that intestine, previously to its descent into the scrotum.

A scrotal hernia, formed by the cœcum, the appendix vermiformis, and beginning of the colon, is constantly of a very considerable size; but the case cannot be recognized by this character, and, even in the operation itself, it is attended with appearances well calculated to produce mistake. In fact, after dividing the integuments, one might be led to suppose, that the hernial sac was either lacerated, or entirely deficient: but if attention be paid to the natural situation of the cœcum and beginning of the colon in the right ileo-lumbar region, and it be recollected, that these bowels are partly situated out of the peritoneum, it will at once appear clear enough, that, in a hernia,

they can only be in part surrounded by a hernial sac, a portion of their external side being in immediate contact with the adjoining cellular substance. In such a case, were an uninformed practitioner to direct his incision a little too much towards the outside of the tumour, he would find the cæcum and colon immediately under the cremaster, and be induced to believe, that these bowels had no hernial sac. But, says Scarpa, he would quickly recover from his mistake, if he were to cut into the hernia on the middle line, or on its internal side; for then he would be sure to find under the cremaster and subjacent cellular membrane, the true hernial sac, containing the greatest part of the cæcum with the appendix vermiformis. At the same time, he would remark a broad membranous fold, extending from the parietes of the sac to the surface of the intestine, of which a small part is on the outside of the hernial sac, just as it was on the outside of the cavity of the peritoneum in the right lumbar region.

In explaining why some hernia of the cæcum are reducible, and others irreducible, Scarpa reminds us of the well-known difficulty, and even impossibility, of reducing a large scrotal hernia, when formed by the cæcum, the appendix vermiformis, and beginning of the colon, owing to the strong connexion which these bowels have with the hernial sac. Such connexion is not formed by any preternatural adhesion, but only by the folds of peritoneum, which, in the natural state, fixed the upper portion of the cæcum in the right ileo-lumbar region. Before Scarpa, no writer had satisfactorily explained, why in some inguinal, or scrotal herniæ of the cæcum, adhesions, unpreceded by any inflammation, prevail betwixt this intestine and the hernial sac. Nor had the least attempt been made to investigate the cause, why herniæ of this description, which are recent and of small size, may be easily reduced, while larger cases are irreducible, and always complicated with intimate adhesions to the hernial sac. In the first case, the hernia merely consists of the cul-de-sac of the cæcum; and as this part of the bowel is completely unattached in the abdomen, it is generally so in the hernial sac. On the contrary, in the second case, the whole of the cæcum, with a part of the colon, being included in the hernia, and the natural attachments of these viscera making part of the hernial sac, the consequence is, that they are fixed at the bottom of the scrotum, in the same manner as they were in the right ileo-lumbar region previously to their displacement.

Whenever an operation is to be done on a large, old scrotal hernia of the right side, the first thing which the surgeon should consider, is whether the disease is not produced by the cæcum and beginning of the colon. Besides the size and long



standing of the tumour, its irregular knobby shape may excite a suspicion of such a complication. The probability of the occurrence will be increased, if it be found, that while the hernia was confined to the groin, it was always capable of reduction, but that after its descent into the scrotum, though never attended with symptoms of inflammation, or strangulation, it could no longer be returned, at least completely; if it be ascertained, that whenever the swelling became larger, the patient was often annoyed with colic complaints, the termination of which always coincided with the subsidence of the tumour, and was accelerated by the use of aperient medicines and clysters; if the patient should have experienced habitually after digestion, and a little while before going to stool, a sensation of heaviness and dragging in the scrotum; if a depression, proportionate to the size of the hernia, be observable in the right iliac region; and, lastly, if the strangulation should appear to have been brought on by intemperance, and an accumulation of ill-digested aliment, rather than by any effort, that has forced an additional portion of bowel into the tumour.

In considering the diagnosis, one or two circumstances, pointed out by my friend Mr. Lawrence, are particularly entitled to attention, as affording a valuable criterion. These descents, says he, must take place gradually; the displacement of parts, connected as the cæcum and colon are in their natural situation, must be a slow process; and, consequently, herniæ formed suddenly by any accidental cause, or violent exertion, cannot be of this kind.\*

In this species of hernia, as well as in all others of large size, the symptoms of strangulation are hardly ever violent, either on account of the width of the neck of the hernial sac and abdominal ring, or the relaxation and looseness of the aponeurosis of the external oblique muscle. In every case, it is a matter of the first-rate importance, not to confound the symptoms of strangulation with those of colic and irritation, proceeding from the adhesion of the bowels to the hernial sac. When a large old scrotal hernia becomes strangulated, the evacuations from the bowels are always totally suppressed; the swelling is painful; and the patient is affected with vomiting, hiccough, and fever. On the contrary, in the colic from irritation resembling strangulation, the discharge of feces and air from the rectum is never entirely suppressed; and these evacuations are increased when mild purgatives and clysters are exhibited. If nausea, and tendency to vomiting occur, it is at long intervals; strictly speaking, there is no fever; and the swelling, though tense and bulky, is not painful on being handled. Under such circum-

\* On Ruptures, p. 197, edit. 3.

stances, mildly aperient medicines, repeated clysters, and cold applications to the hernia, may be employed with considerable success, and the surgeon should not be in too much haste to operate.

But, if a hernia of the cœcum, of long standing and great size, were to be really strangulated, so that the only chance of saving the patient's life depended upon the performance of the operation, the surgeon, before undertaking it, should recollect, that the bowels contained in the tumour do not admit of being completely returned into the abdomen, by reason of the particular connexions which they have with the hernial sac; and that, in this case, as well as in all scrotal herniæ of large size, the neck of the hernial sac is never the immediate seat of strangulation. If there be no indication of gangrene, says Scarpa, he is to be content with exposing the abdominal ring, which he is to make a slight division of outwards, without cutting the neck of the hernial sac. By means of this simple incision, he will obviate the stricture, without exposing the bowels to the air. Afterwards, he is to endeavour to promote the passage of the feces and wind through the protruded bowels, by means of gentle pressure on the swelling, and try to return the viscera, as far as practicable, into the abdomen. If, from inadvertence, from an apprehension of gangrene, or from mistaking the nature of the hernia, the operator should have opened the hernial sac, then the best mode of bringing the operation to a conclusion, would be to remove the stricture, return such portion of the bowel as will admit of it, and cover the rest with the sides of the hernial sac, and the integuments of the scrotum. The best applications are generally fomentations, and light simple dressings. Under such treatment, the intestine, notwithstanding its adhesions to the hernial sac, will gradually return into the abdomen; and the portion which cannot do so, will granulate, and unite with integuments. There will then remain in the groin merely a tumour, composed of the cul-de-sac of the cœcum, for the keeping of which from all pressure, and from becoming in time larger, the patient must wear during the remainder of his life, a truss with a concave pad.

When the hernia is complicated with gangrene, an outlet is to be made for the feces, by a longitudinal division of the gangrenous bowel, care being taken that the stricture itself, if it now require it, be also divided.

## CHAPTER XXXVII.

## HYDROCELE.

OF this disease there are three principal kinds; one, in which the fluid is lodged in the cellular texture of the scrotum; another, in which it is contained in the tunica vaginalis testis; and a third, in which the fluid collects in the spermatic cord.

The first sort, sometimes named *hydrocele œdematodes*, is strictly only an anasarcaous tumour of the scrotum, and generally a symptom of a dropsical affection of the whole constitution. The two other kinds are absolutely local, commonly attack one side only, and are frequently found in persons who are perfectly free from all other complaints.

## HYDROCELE ŒDEMATODES,

Is a swelling of the scrotum, from a gradual effusion of limpid fluid in the cellular membrane: it is softish and pale-coloured, and, when touched with the finger, the impression continues for some time afterwards. As the disease increases, the part becomes firmer, smoother, and tenser, the corrugations being at length entirely effaced. The neighbouring parts, especially the penis, are generally affected at the same time, and the latter organ is often surprisingly deformed, the prepuce being sometimes so swelled as to obstruct the free discharge of the urine. In the worst stages of the disease, the extreme tension of the skin and cellular membrane brings on inflammation, and sloughing.

The most frequent causes of this species of hydrocele do not differ from those, which are concerned in the production of ascites and œdema in general. The pressure of certain tumours upon the large veins and lymphatics within the abdomen; the accidental rupture of a hydrocele of the tunica vaginalis, or the water of this last disease not having a ready outlet through the puncture in the skin, in consequence of the aperture having changed its situation with respect to the opening in the tunica vaginalis, after the lancet is withdrawn; violent contusions of the scrotum; the pressure of a tight ill-made truss; are all circumstances which may give rise to an œdematous hydrocele. In infants it may be the effect of pressure sustained during delivery, and of the part being exposed to the irritation of the urine.\*

\* Callisen, *Systema Chirurgiæ Hodiernæ*, vol. ii. p. 64.

In the treatment, it is necessary to remove, if possible, the causes. When the complaint is merely an effect of a dropsical tendency in the whole system, the possibility of a cure will of course depend upon the success with which the general indisposition can be combated. Thus, if ascites cannot be cured, it will be in vain to expect to disperse the dropsical affection of the scrotum. In particular examples, to which I have alluded, hydrocele œdematodes is quite a local disease, and it is then to be treated according to rules laid down in the chapter on œdema.

#### HYDROCELE OF THE TUNICA VAGINALIS.

This complaint has generally the appearance of a smooth, oblong, or pyriform swelling of one side of the scrotum.\* It is not attended with any discolouration of the skin, and, if carefully watched from the beginning, it is observed at first only at the lower part of the scrotum, whence it gradually spreads upward, until it reaches the higher part of the spermatic cord on the outside of the ring. Its ordinary shape somewhat resembles that of a swan's-egg pear, with its broad part downwards. In an early stage, it presents a softish feel, attended with fluctuation; but, on the fingers being removed, it immediately rises to its former level. It cannot be diminished either by pressure, or by making the patient lie down upon his back; it cannot be pushed into the cavity of the abdomen; nor can any impulse be distinguished in it, when the patient coughs; circumstances marking its difference from hernia. When the disease is more advanced, and has attained a larger size, the tumour becomes oblong, and its weight and firmness increase, though they are still much less than in sarcocoele. At the same time, the fluctuation grows less distinct. If the fluid be clear, the tunica vaginalis and the cremaster not much thickened, and a candle be placed behind the tumour, the scrotum will present a semitransparent appearance. When the quantity of fluid is considerable, the testicle cannot be plainly felt, being distinguishable only at the upper and back part of the tumour, by a certain hard feel. The spermatic cord, however, is still obvious to the touch. Even when the swelling has acquired its greatest size, and the scrotum is considerably distended, the

\* "Morbus interdum in utroque latere scroti occurrit." Callisen, *Syst. Chirurgiæ Hodiernæ*, vol. ii. p. 76. Also, Sir Astley Cooper's *Lectures*, vol. ii. p. 88. A hydrocele of the tunica vaginalis is sometimes accompanied with an encysted hydrocele of the cord, which case is known by the tumours having originated at two different points. There is also a constriction between them; but this is not a sure criterion, as the sac of a common hydrocele is sometimes divided, by a middle contracted part, into two cavities, which, however, communicate. Richerand, *Nosographie Chir.* t. iv. p. 268, edit. 4.



corrugations are seldom so completely obliterated as in the œdematous hydrocele. The penis appears small, and, as it were, buried in the tumour. In old cases, the integuments of the scrotum are sometimes much thickened; the veins large; and, upon handling the swelling, a sense of elasticity, rather than of fluctuation, is communicated. When the hydrocele is of very great size, the spermatic cord itself may be concealed by it, nearly, or quite up to the ring. In children, the water extends higher up the cord, than in adults.\*

The quantity of fluid varies in different cases: a hydrocele of ordinary size, contains about six, eight, or ten ounces; but instances are recorded, in which four,† and even six‡ pints of water were drawn off. The largest hydrocele perhaps ever met with, was that of Mr. Gibbon, from which six quarts of fluid were let out by Mr. Cline.§ The disease is rather inconvenient, on account of its size and weight, than painful, or dangerous. When large, however, and not supported in a bag-truss, it drags the spermatic cord, and creates pain in the loins. It also interferes with every kind of labour, in which the lower extremities are concerned, and prevents the individual from riding on horseback. Hence many patients cannot follow the particular avocations on which their livelihood depends, and are compelled to seek a cure. The manner, in which the swelling draws the integuments from the penis, prevents the full erection of that organ; a circumstance, which is frequently a source of great anxiety; because the patient, not understanding the precise nature of the disorder, is apt to suppose his virility irrecoverably impaired. When the swelling is very large, the penis is completely retracted, and the urine, dribbling over the front of the scrotum, may bring on a good deal of inflammation, and even troublesome ulcerations, unless the greatest attention be paid to cleanliness. The transparency of the tumour, its fluctuation, and its freedom from pain, may be regarded as the best criterion of this species of hydrocele.

Sometimes, in certain enlargements of the testicle, there is an appearance of transparency, but it is confined to the lower part of the swelling; this happened in a case noticed by Mr. Cross, in La Charité, at Paris, and was fully accounted for by a small quantity of transparent fluid found in that portion of the tumour, after an operation. || But, as in some cases referred

\* Hunter, Observation on Certain Parts of the Animal Œconomy, p. 12, edit. 2.

† Wadd's Cases of Diseased Bladder and Testicle, p. 61. 4to. London, 1815.

‡ Earle on Hydrocele.

§ Sir A. Cooper's Lectures, vol. ii. p. 92.

|| See Cross's Sketches of the Medical Schools of Paris, pp. 140, 141. 8vo. Lond. 1815.

to by Warner, no fluid issued from openings made with a lancet, I know not how to explain the cause of the transparency, except by supposing that the punctures had been made where the tunica vaginalis happened to be partially adherent.

Scarpa, who has carefully examined hydroceles in the dead subject, assures us, that, whenever the tumour is large, the spermatic vessels are found so displaced and separated, that the artery and vas deferens usually lie on one side of the swelling, and the veins on the other; and that sometimes all these different vessels extend from the sides towards the front of the tumour, chiefly at its lower part. In treating of hydrocele of the tunica vaginalis, many writers of great eminence have been entirely silent respecting the cremaster muscle, though it has an intimate connexion with the disease, the collection of water being, in reality, contained in a double sac, formed of the muscular sheath and aponeurosis of the cremaster, and of the tunica vaginalis. In large, old hydroceles, the exterior of these investments acquires considerable strength and thickness, while the tunica vaginalis itself mostly remains in its natural state. In the operation, the surgeon should be well apprized that he has to pierce a sac formed of two separate layers, very different in their structure, and capable of slipping, as it were, over each other.\*

Here it is but justice to remark, that the animadversion of Scarpa, respecting the silence of writers about the intimate connexion which the cremaster muscle has with hydrocele, should not be extended to several English authors, who have been very careful to notice this important circumstance. In a hydrocele, as well as a rupture, the cremaster, says Mr. Hunter, "becomes stronger than usual, and its fibres can be traced spreading on the tunica vaginalis, and seem at last to be lost upon it near to the lower end of the body of the testicle."† The expansion of the cremaster over the tunica vaginalis in hydrocele, is also particularly noticed both by Warner‡ and Mr. C. Bell.§

A hydrocele should be carefully distinguished from a hernia, which it may always readily be, by adverting to those differences which have been already pointed out;|| particularly, to the absence of all impulse in the tumour when the patient coughs, the unchanged size of the swelling in every position of the body, and the quiet undisturbed state of the intestinal canal.¶

\* Scarpa, *Traité Pratique des Hernies*, pp. 51-64.

† Obs. on certain Parts of the Animal Economy, p. 6, edit. 2.

‡ Cases in Surgery, p. 288, edit. 4.

§ Operative Surgery, vol. i. p. 194. 8vo. Lond. 1807.

|| See NOTE D.

¶ A hernia and hydrocele of the tunica vaginalis may exist together; a

*Fungus hæmatodes testis* is more liable, than any other disease, to be mistaken for hydrocele; for the swelling is so elastic, and the feel which it communicates so like that of a fluid, that many surgeons of great experience have been deceived, and actually introduced a trocar into the tumour.

A hydrocele may be discriminated from a common sarcocoele, or scirrhus testicle, by being compressible, indolent, and much lighter than if the substance of the swelling were of a fleshy nature. At the same time, it is even and uniform, and accompanied with a fluctuation that is always sufficiently obvious, except when the great tension of the swelling communicates rather the feel of simple elasticity, than that of the positive presence of a fluid. On the contrary, a scirrhus testicle is an indurated, heavy, irregular, painful tumour, unattended either with fluctuation or transparency; it is flatter at its sides than a hydrocele; the patient often has an unhealthy look; and the pain in the loins is considerable.

With regard to the causes of hydrocele, it is a subject, about which little is known. Sir Astley Cooper states, that the absorbent vessels of the spermatic cord are much enlarged in hydrocele, and he adopts the opinion, that the disease consists rather in increased secretion, than diminished absorption.\* In general, the complaint appears to originate spontaneously; but it has been sometimes observed to follow a bruise, or the friction which the scrotum suffers in hard riding; and, if any faith can be put in the conjectures of the late Mr. Ramsden, it would appear, that the origin of this disease is sometimes owing to an irritable state of the urethra.† The pressure of ill-constructed trusses on the spermatic cord, is alleged to be sometimes the cause of the disease. Hitherto, I am afraid, that it cannot be truly said, that our surmises, respecting the causes of hydrocele, have afforded any material light in the investigation of the treatment. Fortunately, this imperfection in our knowledge, is not of much practical consequence, as the surgeon is only anxious to have a safe and certain method of cure, and this he already possesses. The complaint frequently affects the most healthy and robust, and young subjects as well as old ones: it has no connexion with a general dropsical habit or debility; and it is generally, perhaps always, quite a local affection.

complication known by considering the symptoms peculiar to each affection. In cases of strangulated bubonocoele, accompanied with such a hydrocele, the operation for the hernia may prove a cure of the other disease, by accidentally exciting inflammation and sloughing of the distended tunica vaginalis. See a case to this purport related by Flajani, *Collezione d'Osservazioni*, &c. t. ii.

\* Sir A. Cooper, *Lectures*, vol. ii. p. 93.

† See *Practical Obs. on Sclerocoele*, &c. pp. 198-201.

The prognosis chiefly depends upon the state of the testicle and of the patient's health; for when this is good, the collection of fluid in the tunica vaginalis is to be regarded as a simple complaint, rather attended with inconvenience than risk: though if the statements of some writers be correct, the long-continued pressure of the water upon the testis, when the swelling is of very considerable size, may induce an atrophy of that organ. When, however, the effusion of fluid in the tunica vaginalis is the consequence of a disease of the testis, constituting a hydro-sarcocele, the prognosis is unfavourable, because the hydrocele cannot be cured, unless the testis either admit of being restored to its natural state, or of being removed by an operation. With a very few exceptions, if the surgeon, in the case of a hydro-sarcocele, were to aim only at removing the fluid, it would have the bad effect of exasperating the other more serious disease, in a degree that might render every future measure unavailing. In general, when a hydrocele is left to itself in adult subjects, no cure can be effected by nature alone, the examples of a natural cure, from accidental inflammation and sloughing of the scrotum, being very rare; but, when properly treated, it may almost always be removed both with safety and certainty. In young persons, the cure is still easier; and, in children under seven years of age, nature, without any assistance, not unfrequently disperses the complaint.\* Sometimes the tumour is so tense, that it bursts, or it is ruptured by external violence, or from an accidental effort of the patient, and the fluid is effused in the cellular membrane of the scrotum. Accidents of this kind sometimes terminate in a radical cure. There are two methods of treatment, one called *palliative*, the other *radical*.

#### PALLIATIVE TREATMENT.

This consists in puncturing the tumour with a lancet, or small trocar, for the purpose of merely discharging the fluid. When the patient's state of health forbids the radical treatment, which, though mild, is attended in some constitutions with risk; when his timidity interferes with it, or it is inconvenient for him to undergo the requisite confinement, the simple tapping of the hydrocele may be all that can be attempted. For the performance of it, the trocar should generally be preferred, as the cannula facilitates the escape of the water, and prevents its diffusing itself in the cellular texture of the scrotum. When, however, the hydrocele is small, or the nature of the disease is at all doubtful, a lancet ought to be used, as an opening can be more cautiously made with it than with a trocar, the sudden intro-

\* Sir A. Cooper, Lectures, vol. ii. p. 97.



duction of which might injure the testicle. This precept deserves attention, because there are surgeons who think, that the fluid of a hydrocele should be let out as soon as a puncture can be made with security; alleging, as a reason for the practice, the greater probability of the absorbents being able to resume their functions, and complete the cure while the disease is recent, and the tunica vaginalis unthickened, than at a later period.\* When a hydrocele is large, the palliative treatment ought first to be practised, and the radical cure not undertaken till the tumour has acquired again about two-thirds of its former magnitude. The reason of this advice is founded on what experience had taught the late Sir J. Earle, viz. that when the radical treatment is applied at once to a large tense hydrocele, the inflammatory symptoms often run to an unnecessary height. As hydroceles are not unfrequently complicated with disease of the testicle and spermatic cord, and the exact state of these parts, especially of the testicle, cannot always be determined, while the tunica vaginalis is considerably distended, the surgeon sometimes finds it necessary to let out the fluid, in order to ascertain whether the case be a simple hydrocele or not. In fact, until all doubt be removed concerning the sound state of the testicle, the practitioner cannot know what further proceeding should be adopted; that is, whether the case ought to be treated as common hydrocele, or as a hydro-sarcocele, in which latter disease, the means customarily adopted for the radical cure of the other affection, would be inapplicable and hazardous.†

With whatever intention the operation is undertaken, the surgeon should be sure of the presence of fluid before the puncture is made; or at all events, if a degree of doubt cannot be dispelled, a small opening should be carefully made with a lancet into the tunica vaginalis. When this has been done, and the disease is found to be not a simple hydrocele, but a thoroughly diseased testicle, (for instance, a fungus hæmatodes,) the surgeon should perform castration without further delay.

In a common hydrocele, the best place for the puncture is at the anterior and lower part of the tumour, the spot which is most remote from the testicle. At the same time, if the swell-

\* See Wadd's Cases of Diseased Bladder and Testicle, p. 54. 4to. Lond. 1815, in which work a hydrocele is mentioned, that was let out with a trocar, at the end of a fortnight, and did not return. Mr. Pott speaks of two similar cases; and, says Mr. Wadd, a patient of mine, lately showed me a hydrocele, which contained half a pint of fluid, attributed to a blow he received on the testicle five weeks before. It was evacuated with a lancet, and has not returned since.

† See Loder's Chirurgisch-Medicinische Beobachtungen, b. i. p. 154. 8vo. Weimar, 1794.

ing be large, we are not to be unmindful of the possibility of the spermatic vessels lying over the sides, or even over the front of the lower part of the sac, and the cautions, which Scarpa has offered on this subject, are highly valuable. The patient is to stand before the surgeon, who sits down, and grasps the scrotum with his left hand, so as to make the fluid bulge forwards, and the swelling tense. The trocar must not be introduced to an unnecessary depth, lest the testicle be injured; a danger which will also be more certainly avoided, if the point of the instrument be directed obliquely upward, and not too much backward.\* In order to hinder the trocar from penetrating too deeply, the thumb may be placed upon the instrument, about half or three quarters of an inch from its point. As soon as the stilette has entered the tunica vaginalis, it need be pushed no further, for it has done its office; on the contrary, the surgeon is now to withdraw it, and at the same instant, push the cannula alone further into the cavity of the tunica vaginalis. The necessity of the cannula being well introduced, arises from the collapse of the preceding membrane, when the fluid escapes, and its consequent tendency to slip off the extremity of the tube, whereby the completion of the operation might be interrupted.

In the hydroceles of children, the testicle generally occupies a lower situation than in those of grown up persons, and the swelling extends higher up the cord, owing to the cavity of the tunica vaginalis naturally reaching further in that direction. Hence, in tapping the hydrocele of a child, (which, however, is hardly ever necessary,) the surgeon should introduce the trocar somewhat higher up, than the place usually chosen in adults, and direct the instrument rather less obliquely backwards.† After the fluid is all discharged, the cannula is to be withdrawn, a small piece of soap plaster put over the puncture, and a bag-truss applied.

Such is the palliative operation, which commonly produces only a temporary removal of the swelling, as the water afterwards collects again, and the patient relapses into his former state. Hence, unless the same method be repeated from time to time, or the radical treatment adopted, the patient soon experiences all the inconveniences of the complaint again. The re-accumulation of the fluid is generally gradual, but cases have happened, in which the water collected again to its former quantity, as early as three or four hours after the operation. In one example of this kind, Flajani repeated the puncture next morning, and let out more than a pint of turbid dense fluid, and

\* C. Bell's *Operative Surgery*, vol. i. p. 199.

† Richerand, *Nosographie Chir.* tom. iv. p. 243, edit. 2.

the disease did not return.\* However, when the tumour forms thus suddenly again, it is almost always from an extravasation of the blood, constituting the disease termed *hæmatocele*. In a limited proportion of cases, the operation of simply tapping a hydrocele, and letting out the fluid, is unexpectedly followed by a permanent cure.† This apparently trifling operation may have a fatal result, in consequence of its bringing on violent inflammation and sloughing of the scrotum.‡

## RADICAL CURE.

This is sometimes, though not very often, in adult subjects, effected by means of external applications to the scrotum; it may be more certainly accomplished by letting out the fluid, and either cutting away the loose part of the sac, or exciting such a degree of inflammation in the tunica vaginalis and testicle, as leads to an universal adhesion of the inner surface of this membrane to the tunica albuginea, and, consequently, to a complete obliteration of that cavity in which the water is collected. Without such obliteration, it has been generally supposed, that the relief would always be only temporary. This is an opinion, however, which has of late years been rendered questionable, by the observations of Mr. Ramsden,§ Mr. Wadd,|| and Mr. Kinder Wood.¶ The latter gentleman finds, that, if the tumour be punctured with an abscess lancet, and a little bit of the sac be drawn out with a hook, and cut off, a very mild inflammation of the cavity follows, unattended with confinement or general indisposition, and frequently ending in a radical cure, *though no obliteration of the cavity of the tunica vaginalis*

\* See Collezione d'Osservazioni e Riflessioni di Chirurgia di Guiseppe Flajani, t. ii. p. 164. 8vo. Roma, 1800.

† See Loder's Chirurgisch-Medicinische Beobachtungen, b. i. p. 158. A permanent cure may follow the simple tapping of the tumour, when a largish trocar or lancet has been used; when the cannula has rubbed against the testis; when the patient will not afterwards keep himself quiet, (Flajani, vol. cit. p. 183;) neglects to wear a bag-truss; or is of a very irritable habit. In young persons, a radical cure has been the consequence of wetting the scrotum with lime-water after tapping. (Ib. page 182.) Cases, which were hydro-sarcocèles and tapped, have sometimes terminated in a gradual disappearance of the fluid that collected again on the testis regaining a healthy state. (Flajani, t. ii. p. 181.) If, says Bertrandi, though the puncture has been made according to all the rules of art, and without any fault, the scrotum should inflame and suppurate, a longitudinal incision must be made to let the matter have a free exit, and thus a hydrocele, to which it was intended to apply only the palliative treatment, is perfectly cured without the chance of relapse. *Traité des Operations*, p. 189.

‡ Sir Astley Cooper's Lectures, vol. ii. p. 99.

§ Practical Obs. on Sclerocele, &c. 8vo.

|| Cases of Diseased Bladder and Testicle, p. 51, &c. 4to. Lond. 1815.

¶ Medico-Chir. Trans. vol. ix. p. 38, &c.

*be produced.* The correctness of this statement, Mr. Wood conceives, is further corroborated by a reference to cases, in which a radical cure is brought about by discutient applications. These sentiments, however, stand in need of confirmation by dissection; for not only might the foregoing writer be deceived in the judgment which he formed from the external feel of the scrotum, that no adhesion had taken place between the tunica vaginalis and tunica albuginea, but also with respect to another opinion, viz. that when a hydrocele is cured by external applications, no such adhesion takes place. In one patient, who died some time after he had been cured of a hydrocele by the lotion of a muriate of ammonia, Mr. Keate assures us, that the tunica vaginalis was found closely adherent at every point to the tunica albuginea.\* The late Mr. Ramsden principally founded his theory upon the well-known fact, that the scrotum sometimes becomes transparent after the operation, whence he inferred, that another collection of fluid must be effused, which is subsequently removed without obliteration of the cavity of the tunica vaginalis.

That, in many instances, a considerable effusion of serum and coagulable lymph takes place within the tunica vaginalis, after the use of an injection, is a truth, which will be readily admitted by every man of experience. That such effusion may produce an appearance of transparency, and even a fluctuation, leading to an idea that the disease has returned, and the operation miscarried, is also equally certain. But it does not follow from these premises, that, when the tumour is afterwards lessened by the action of the absorbents, the cavity of the tunica vaginalis will remain; an inference, which ought not to be assumed, without the evidence of dissection. As Richerand has observed, "the radical cure of a hydrocele is not always effected by means of an adhesion *immediately* formed between the tunica vaginalis, and the surface of the testicle. In most instances things do not happen in this manner. The irritation produced, occasions an exudation of a lymphatic albuminous matter, which, becoming organized betwixt the two surfaces, unites them together. This matter, which is very different from pus, is often so copious as to cause a fluctuation, and make an inexperienced surgeon believe a new effusion of water has happened within the tunica vaginalis, and that the operation has failed. In patients who have died under these circumstances, the tunica vaginalis has been found distended with flakes of albumen, which, concreting and becoming organized, forms the adhesion between the tunica vaginalis and the testicle."† These remarks

\* See Keate's Cases of Hydrócele, &c. p. 39.

† Richerand, Nosographie Chir. t. iv. pp. 284, 285, edit. 4.



are adduced, however, not with any intention of denying the possibility of radically curing a hydrocele, without obliterating the cavity of the tunica vaginalis;\* but only to prove, that some of the circumstances, brought forward as evidence of the cure being thus accomplished, when the hydrocele has been injected, are by no means conclusive. When a spontaneous cure takes place in a child, I suppose there is usually no obliteration of the cavity in which the fluid was collected; and, probably, no such change happens when the disease is removed by external applications, unless they chance to excite inflammation.

## EXTERNAL APPLICATIONS.

That hydroceles might occasionally be cured by means of discutient applications, was a fact not unknown to the ancients. The plan is recommended by *Ætius*; and *Wiseman*,† the father of English surgery, even adduces cases in proof of its success. That it would sometimes answer, might, indeed, have been anticipated from the consideration of another circumstance, adverted to by the late Mr. Keate, viz. “our frequently seeing collections of water in the tunica vaginalis disappear in consequence of some accidental cause, as a blow, the gout, fever,” &c.‡ The treatment, tried by this gentleman, simply consisted in applying to the tumour, three times a day, linen wet with a lotion composed of an ounce of the muriate of ammonia, dissolved in four ounces of vinegar, and a similar quantity of spirit of wine. The swelling was also supported in a bag-truss. In children, hydroceles often get well of themselves, or yield to discutient applications. Hence, in such patients, as Mr. Wadd has remarked, it is seldom necessary to resort to an operation.§ I am happy to be able to corroborate this statement by the testimony of a gentleman, whose experience in the diseases of children has been for some years very extensive; I mean Mr. M<sup>c</sup>Gregor, surgeon to the Lock Hospital and York Military Asylum, who has had abundant opportunity of ascertaining the fact, that, in young subjects with hydrocele, there is seldom any real occasion for an operation, as the disease may be got rid of by any local remedies, calculated to excite the ac-

\* In one case, cured by injection, and dissected some years afterwards, the adhesions were only partial, and the rest of the tunica vaginalis was more relaxed than natural; so that Sir A. Cooper concluded, that the action of the vessels had only been changed. Lectures, vol. ii. p. 109.

† *Wiseman*, b. i. chap. 23.

‡ See Keate's Cases of Hydrocele, with Observations on a peculiar Method of treating that Disease; to which is subjoined a singular case of hernia vesicæ urinariæ, complicated with hydrocele, &c. p. 19. 8vo. Lond. 1788.

§ Wadd's Cases of Diseased Bladder and Testicle, p. 54; also, Sir A. Cooper's Lectures, vol. ii. p. 96.

tion of the absorbents. In his own practice, he has found fumigations of the scrotum with cinnabar, one of the most efficient means. A boy, twelve years old, was cured of a hydrocele, by exposing the swelling to the steam of vinegar, applying the *lotio plumbi acetatis*, and exhibiting purgatives.\* Successful as this practice appears to be in children, it is very uncertain in adults; and though, in them, it is sometimes found to answer, it more frequently fails. In a part of the cases, brought forward by Mr. Keate in favour of the method, the lotion was applied as soon as the water had been discharged; and when this mode is followed, I believe a cure is more likely to be the result, than when the swelling is not emptied; at all events, there is a case or two in the writings of Flajani,† tending to prove the truth of this remark. A hydrocele, which was apparently the consequence of the pressure of an ill-made truss on the spermatic cord, was cured by taking off the truss, and using resolvent lotions, and a suspensory bandage.‡ I know of no particular objection to a trial of external applications, except their frequent inefficacy in adult patients. Candour obliges me to add, however, that, in one or two instances, which have been verbally communicated to me, the patient not only lost time in the experiment, but suffered a good deal of pain from superficial inflammation of the scrotum, excited by the muriate of ammonia; an occasional inconvenience, of which, indeed, Mr. Keate himself makes mention.§

\* Richter, *Chir. Bibliothek*. b. ix. p. 593. Sir A. Cooper, in cases of children, directs a little calomel and rhubarb occasionally, and orders a suspensory bandage, which is kept wet with *liq. ammon. acet.* in every six ounces of which two drachms of muriate of ammonia are dissolved. See *Lectures*, vol. ii. p. 96.

† In one young man, twenty-two years of age, a hydrocele was radically cured by simply puncturing it, and covering the scrotum with a compress dipped in lime-water. See *Collezione d'Osservazioni e Riflessioni di Chirurgia*, t. ii. p. 182. The practice is sanctioned by Sir A. Cooper, *Lectures*, vol. ii. p. 98.

‡ See Loder's *Chirurgisch-Medicinische Beobachtungen*, b. i. pp. 168, 169.

§ In addition to the above observations, tending to prove the possibility of dispersing hydroceles, especially in young subjects, the following facts merit notice. Morand dispersed several hydroceles by making an issue in the scrotum. Douglas did the same thing by means of an issue near the groin. Schmucker cured one hydrocele by applying the steam of vinegar night and morning, and the same fluid as a lotion at other times. Warner often cured hydroceles in children by means of purgatives and outward applications. (Cases in Surgery, p. 302, edit. 4.) Mohrenheim cured a hydrocele in a similar manner. In children, the disease has yielded to emetics; (Richter, *Chir. Bibliothek*. b. v. p. 120;) to mercury; (Dussaussoy;) to an attack of gout. (Pott.) Richter suggests the external application of tartar emetic. *Anfangsgr.* b. vi. p. 63.

## EXCISION OF THE SAC,

Which was always followed by considerable inflammation and fever, and sometimes by fatal effects,\* is at present entirely rejected from the practice of surgery in England. When the tunica vaginalis is much thickened, a few foreign practitioners yet deem its excision necessary; but, in this country, impartial experience at length declares against the necessity of the proceeding, even in such a case, and an ossified state of that membrane is the only condition now allowed to require so severe a method. Specimens of such ossifications are contained in Mr. C. Bell's Museum,† and the collection at Guy's Hospital.‡ Though an unqualified condemnation of the practice of excision, as it was formerly executed, is now the general sentiment, I would not wish the remark to apply to Mr. Kinder Wood's method, which has been already spoken of, and which, from the reports made to me about it, I am inclined to think, is both mild and effectual.

## SETON.

The tumour is to be pierced, and the fluid discharged through the cannula in the common way. A seton-cannula is then to be passed through that of the trocar, until it reaches the upper part of the tunica vaginalis. This having been done, a sharp-pointed eye-probe, armed with a seton, is to be conveyed through the seton-cannula, and pushed from within outwards through that portion of the tunica vaginalis and integuments with which the extremity of the tube is in contact. The seton is then to be drawn through the instrument, until a sufficient quantity is brought out of the upper wound. The two cannulæ are next to be withdrawn, and common dressings applied to the orifices of the punctures, the ends of the seton being fixed, as may be found most convenient, with a couple of slips of adhesive plaster. A bag-truss is to be applied, the patient go to bed, and take an opiate draught. Of all the methods, devised for the cure of hydrocele, none are more ingenious and effectual than the seton, and next to the treatment with an injection, it is unquestionably the mildest plan, and most deserving of recommendation. When the disease resists discutient applications in young subjects, Sir Astley Cooper passes a curved needle and thread transversely through the hydrocele, then ties the thread, cuts off the needle, and lets the child run about, till the scrotum inflames, which usually hap-

\* See Warner's Cases in Surgery, p. 301, edit. 4.

† Operative Surgery, vol. i. p. 207. 8vo. Lond. 1807.

‡ Sir A. Cooper, Lectures, vol. ii. p. 93.

pens in about a week, at which period, the seton is withdrawn, and the adhesive inflammation completes the cure.\*

#### CAUSTIC.

When this practice used to prevail, caustic potassa, with quicklime, was mostly employed, with which an eschar, about half an inch broad, was made along the whole front of the tumour. The treatment of hydrocele with caustic may at present be considered as entirely exploded; for, when the eschar separates, the opening seldom extends into the tunica vaginalis, and a cutting instrument must after all be used for discharging the fluid. On the whole, this plan is far more painful, and uncertain in its effect, than several of the other methods.

#### INCISION.

This is a method which has had several distinguished modern surgeons amongst its advocates, as the names of Richter,† Loder,‡ and Callisen,§ will amply testify; and it is one of the most ancient modes of cure, having been described by Celsus. The anterior and inferior part of the tumour is to have a puncture made in it, of sufficient size to enable the operator to introduce the end of his fore-finger into the cavity of the tunica vaginalis. This he should do immediately, and before all the fluid is discharged, and the tunica vaginalis collapses. Then, with a blunt-pointed curved bistoury, the tunica vaginalis is to be divided throughout its whole length. The wound is then to be gently dressed with lint and a common pledget. The reasons commonly urged in favour of this operation are, that it allows the operator to see the state of the tunica vaginalis and testicle, so that he is perfectly qualified to judge whether they require removal or not. But I have already stated, with respect to the thickening of the tunica vaginalis, that, according to the observations of Sir J. Earle, Mr. C. Bell, and others, it will not impede the cure of a hydrocele, though no excision of the diseased membrane be practised. Laying open the tumour, therefore, cannot be deemed necessary for any purpose of this kind: and, as for the supposed advantage of seeing the state of the testicle, every useful information on this point may be obtained by the feel of the part, after the fluid is let out by a simple puncture. In old large hydroceles, where the vessels of the spermatic cord are separated, and displaced over the fore-part of the bottom of the tumour, an extensive cut through the

\* Lectures, vol. ii. p. 110.

† Medicinische und Chirurgisch Bemerkungen, b. i. p. 119.

‡ Loder, Chirurgisch-Medicinische Beobachtungen, p. 148. 8vo. Weimar, 1795.

§ Callisen, Syst. Chir. Hodiernæ, t. ii.



whole length of the tunica vaginalis must be anatomically objectionable. The severity of the operation, compared either with the cure by means of a seton, or of an injection, is also unfortunately made amends for by no evident advantage, for both the latter methods scarcely ever fail. When the cure by incision is practised, the symptoms sometimes run very high, as we may convince ourselves of, by referring to a case treated in this manner by Flajani, where violent inflammation of the scrotum, fever, general swelling and tension of the belly, and delirium, very nearly carried off the patient.\*

#### TENT.

The way of effecting a radical cure of a hydrocele with a tent, consisted in making an opening into the upper and anterior part of the scrotum with a small lancet, and discharging the water. A roll of linen, or a piece of bougie, was then introduced through the wound into the tunica vaginalis, where its irritation produced inflammation, suppuration, and ultimately an obliteration of the cavity in which the fluid was collected. As this process of cure is liable to do more injury to the testis than is necessary, and more painful and troublesome than the employment of a seton or an injection, it is at present universally abandoned.

#### INJECTION.

The hydrocele is to be tapped with a trocar at its anterior and inferior part, and as soon as the fluid is entirely discharged, and the testicle is felt to be free from the solid and craggy hardness which is indicative of scirrhus, the cavity of the tunica vaginalis is to be distended to its former dimensions with an injection composed of two parts of port wine and one of water. For patients of very irritable constitutions, however, the wine should be more diluted. In speaking of the palliative cure, I took the opportunity of reminding the surgeon of the collapse of the tunica vaginalis, in proportion as the water runs out of it; a circumstance which makes that membrane apt to recede from the cannula, if it be not at first introduced well within it, and held so during the escape of the fluid. When once the tube slips out, it can seldom be passed in again, owing to the aperture in the tunica vaginalis not remaining exactly opposite the puncture in the scrotum; and, for the same reason, the water, instead of readily flowing out, is liable to insinuate itself into the cellular membrane, and a more or less complete interruption of the operation ensues. But when the cannula slips out of

\* Collezione d'Osservazioni e Riflessioni di Chirurgia, t. ii. pp. 160, 161.

the tunica vaginalis, at the time of attempting the radical cure with an injection, the consequences are far more serious; for if the tube cannot be replaced again, the operation must be deferred until the swelling has filled again; or, if the displacement of the cannula unfortunately be not perceived, and the injection be forced, not a drop of it will pass into the cavity of the tunica vaginalis, but the whole will be thrown into the loose cellular texture of the scrotum. Several surgeons of eminence have been known to commit this serious mistake, the general consequences of which are, sloughing of the cellular membrane, tedious and troublesome abscesses, and violent inflammation and sometimes mortification of all the integuments of the scrotum, and death.\* When it is considered, that the accident produces a great deal of severe pain and fever, and much uncertainty, whether the patient, after all this suffering, will be rewarded by a permanent cure of the hydrocele, the mistake cannot fail to be regarded as one of a most vexatious nature. It was from such a cause, that the whole tunica vaginalis sloughed, with part of the scrotum, in a patient operated upon by Boyer.† Another instance is mentioned by Sir J. Earle, in which the surgeon, after letting the tube slip from the tunica vaginalis, continued to force the injection, until he actually filled both sides of the scrotum. Violent inflammation and mortification of the scrotum were the consequences, leaving the testes quite bare. A very similar mistake happened in a case, where I was desired to assist in the operation. These remarks are calculated to impress upon the mind of the surgical reader the necessity of always being sure, that the cannula is well within the tunica vaginalis, before the injection is used, and, in the beginning, the surgeon should proceed in the gentlest and most cautious manner, attentively observing whether any resistance to the entrance of the fluid be experienced, and whether any of it regurgitate in the early stage of this part of the operation. If such resistance to the admission of the fluid be perceived, immediately followed by a return of the liquid outward, these things must either be owing to the end of the tube resting against the testis, or to its having slipped altogether out of the cavity of the tunica vaginalis. Shifting the position of the tube will at once prove, whether the difficulty be owing to the former cause; for if it be, the injection will now readily enter, without the least occasion for force. But, on the contrary, if the obstruction be not removed by altering the position of the cannula, the practitioner has strong cause for suspecting, either that the tunica vaginalis, in collapsing, has slipped away from the tube, or that

\* See Case in Sir A. Cooper's Lectures, vol. ii. p. 107.

† Richerand, *Nosographie Chirurgicale*, t. iv. p. 284, edit. 4.

the latter has been inadvertently drawn more or less out of the scrotum. He must, therefore, not persist in forcing the injection into the part, but endeavour gently to push the tube into the cavity of the tunica vaginalis again, and if this cannot be effected, the attempt at a radical cure should be postponed, because in the empty state of the hydrocele, another puncture with the trocar manifestly cannot be made with due regard to the safety of the testicle. In the case, which fell under my observation, the mistake was not discovered until it was wished to let out the injection again, when it was found, that only the few drops, which happened to be in the tube itself, could be discharged. This was one of the most copious extravasations of injection I have ever witnessed. A good deal of sloughing of the cellular texture of the scrotum followed, with suppuration, the matter descending far along the perinæum. The skin, however, did not mortify, which might be owing to the injection being only one-half of it wine. A radical cure was the result. The mistake must be very frequent; for there are hardly any of my surgical friends in London, who have not witnessed it on one or more occasions; and the occurrence is mentioned by nearly every writer. "This is an accident," says Mr. C. Bell, "which I have seen very frequently happen in the hands of dexterous surgeons. One day, while I was accompanying a celebrated surgeon to the house of a patient on whom he was about to perform this operation, I took occasion to remark to him this danger. He said, that he could not conceive how it should happen, and that he had performed the operation thirty times, without such an accident having occurred. But, in performing the operation that day, the very thing happened: a large proportion of the fluid got into the cellular membrane."\*

In order to avoid the foregoing accident, the most important point is to be careful to push the cannula of the trocar a full inch or more into the cavity of the tunica vaginalis at the moment of withdrawing the stilette, which can always be done during the distended state of that membrane, with the utmost facility. The tube being once properly introduced, the surgeon should hold it steadily within the part himself, and not intrust it to the assistant, the very act of transferring it from one person to another being attended with some risk of displacing it.

Sir Astley Cooper never throws in so much injection as the fluid that has been let out, but he moves the tunica vaginalis about, so that the whole of its inner surface may come into contact with the injection. If a great quantity of the latter be

\* Operative Surgery, vol. i. p. 201.

introduced, the contraction of the cremaster often forces some of it, by the side of the tube, into the cellular membrane.\*

In ordinary cases, the port wine injection is to remain in the sac about five minutes, after which it is to be allowed to escape through the cannula; but where the constitution is known to be very irritable, or the pain in the scrotum, groin, and back, arising from the effects of the presence of the stimulating fluid, are unusually severe, half the time above specified will be sufficient.† The public are much indebted to the late Sir James Earle, for the perfection, to which the mode of curing hydroceles by an injection is now brought. His apparatus was remarkably well made. The stimulating fluid was injected into the tunica vaginalis through a pipe, one end of which was made to fit the cannula of the trocar; the other adapted to receive the neck of an elastic bottle, with a valve, or ball, in the centre of the pipe, to permit the entrance, and prevent the exit of the injection. The latter contrivance was found infinitely more convenient than a stop-cock, which required a hand to turn it.

After the injection has remained long enough in the sac, it is to be let out, particular caution being used to void the whole of it, as the continuance of a part of it behind would cause excessive irritation of the testis and tunica vaginalis, and perhaps it might even ooze into the cellular membrane, and excite inflammation, suppuration, and gangrene. After the operation, a piece of soap plaster is to be applied to the puncture, and a bag-truss to the scrotum. The following morning, a good deal of inflammation has generally ensued, in which circumstance the employment of poultices should commence. When the redness, pain, and swelling of the parts, have a tendency to exceed the necessary degree, they must be counteracted by antiphlogistic remedies.

The cure of hydroceles by an injection, is that which is now generally preferred, as being the mildest plan, and hardly ever failing. A few instances, however, have been published, in which this method of treatment has been followed by very severe inflammation of the scrotum, abscesses, and dangerous

\* Lectures, vol. ii. p. 104.

† The sensibility evinced by the patient, is the principal circumstance by which the strength of the injection, and the duration of its application, are usually regulated. Thus, if no pain be felt, though the stimulating liquid has been kept in the sac eight or ten minutes, Richter thinks it best to let out the injection, and throw in pure wine. However, no dependence can be put upon the degree of pain experienced; and those, who suffer most during the presence of the injection in the scrotum, often have the least inflammation. See Sir A. Cooper's Lectures, vol. ii. p. 104. Undiluted wine is also recommended when the hydrocele is old, has often been tapped, and the tunica vaginalis is thickened. *Anfangsgr. der Wundarzn. b. vi. pp. 98, 99. 8vo. Gott. 1802.*



constitutional disturbance. Nay, great irritation and a locked jaw are said to have been occasioned by the injection in one patient, whose health was previously bad, and who had, a little while before the operation, gone through a course of mercury.\* That severe effects will now and then happen under the best management, must be expected by every surgeon who knows the facility with which extraordinary affections of the system, and high degrees of inflammation, are produced in irritable depraved constitutions. Nor would these evils be at all avoided by having recourse to any of the other means of effecting a radical cure, since general experience declares this to be the mildest.† Amongst others, Professor Schreger has detailed an example, in which very severe symptoms and large abscesses in the scrotum followed the injection of a hydrocele. But without dwelling upon the possibility of some of the injection having been extravasated in this case, it may be right to observe, that the constitution of the patient, here alluded to, is acknowledged to have been, before the operation, in a very bad state, from the effects of syphilis and its treatment. Also, after the fluid had been let out, the testis and cord were found enlarged and indurated; and (what especially claims notice) the injection consisted of two ounces of undiluted Burgundy wine, which were kept in the tunica vaginalis some minutes, but how many is not specified.‡

In a patient, whose extraordinary irritability of constitution is known beforehand, it is always advisable to distend the tunica vaginalis with a much weaker injection than what is commonly used. That hydroceles have been cured by simply letting out the water, and then filling the cavity with air, which was pressed out again, is a fact that has been familiarly known for a long while in this country. But, whether the experiment was given up on account of its uncertainty, or for other reasons, I know not. It is curious to hear, however, that this method of injecting air has been proposed and practised in Germany, as particularly eligible in cases, where it is desirable that the irritation should be very moderate.§ In the examples, however, published by the author referred to below, it is clear enough, (as, indeed, he himself confesses,) that the cure could not be

\* See Wadd's Cases of Diseased Bladder and Testicle, p. 57.

† Loder, who was in England, and studied under Pott, is very partial to the method of cure by incision: yet he acknowledges that the treatment with injection deserves recommendation in irritable subjects, and that it is safe enough when the hydrocele is simple and uncombined with hardness of the testicle. See his *Chirurgisch-Medicinische Beobachtungen*, p. 159.

‡ See Schreger's *Chirurgische Versuche*, b. i. pp. 141-148.

§ Schreger's *Chirurgische Versuche*, b. i. p. 132. *Ueber Heilung der Hydrocele durch Lufteinblasen.*

fairly ascribed altogether to the introduction of the air; for a small tent was passed into the opening, and as the inflation was repeated, this little tent was taken out and reapplied as often as it became necessary to use the air-pipe: such proceedings could not fail to excite inflammation of the parts. The chief argument, urged in favour of the plan, is, that in no other method can the inflammation be so gradually and gently increased according as circumstances may require; an advantage in weak irritable constitutions.

I have heard of hydroceles being cured by injecting the sac with the same fluid that had been let out; and Mr. M'Gregor informed me of three hydroceles, which Mr. Briggs radically cured by merely distending the sac with cold water. These facts, and the effect of simple inflation, are interesting, as delicate patients are sometimes met with, in whom it is desirable to accomplish a cure with as little irritation as possible.

#### CONGENITAL HYDROCELE.

Sometimes, a good deal of fluid accumulates within the tunica vaginalis, while the communication between the abdomen and the cavity of that membrane remains unclosed. This case is commonly named a *congenital hydrocele*. The swelling, which is of an oblong shape, is more or less considerable and tense, according as the patient is in the erect or recumbent posture. As the testis is concealed by the fluid, it cannot be plainly felt; but the spermatic cord can usually be perceived behind, and a little towards the outer side of the upper part of the tumour. When the swelling is compressed, it subsides, because the fluid then passes up into the abdomen. Sometimes, however, when the upper part of the sac is much contracted, the pressure must be applied with skill, and continued a good while before this change can be produced. According to the investigations of Professor Schreger, it appears also, that in some individuals, the occasional difficulty in pressing the fluid up into the abdomen, depends upon the direction and conformation of the neck of the sac, and not merely upon its small diameter. In one case, he found that the fluid could be compressed into the abdomen only when the tumour was inclined in a more oblique direction from within outwards; and, on dissection, it appeared that the perpendicular position of the swelling regularly occasioned an angle or sudden turn in the passage.\* The earliest account of this species of hydrocele was drawn up by M. Viguerie, a surgeon at Toulouse, and communicated to the Academy of Surgery at Paris. If Schreger's statements be correct, it is a disease which must be much

\* Schreger, *Chirurgische Versuche*, b. i. pp. 2-6. 8vo. Nurnberg, 1811.

more frequent in his part of Germany than in England; for, he assures us, that numerous examinations have convinced him, that out of every eight new-born male infants, there is always, at least, one more or less affected with the complaint. In very young infants, he thinks, that the disease is mostly overlooked or not understood, either in consequence of the swelling being mistaken for the effect of a bruise received in the birth, or of its being generally small, owing to the children being kept mostly in the recumbent posture. When the disease continues beyond the first month, and nothing is done, it will sometimes remain during the whole of childhood, the adult age, and even later. In some individuals, the swelling enlarges very slowly, being for many years of inconsiderable size; while, in others, it attains a great magnitude in a short space of time.\*

Although the communication, between the abdomen and tunica vaginalis, is a condition essentially appertaining to this species of hydrocele, such state is not invariably followed by the latter disease; for experience proves, that the peritoneal canal, between the scrotum and belly, frequently remains unclosed a considerable time after birth, without any collection of fluid taking place in the tunica vaginalis. This particularity of structure, therefore, is only to be regarded as a predisposing cause, keeping up the liability to the complaint. Hence, adults who happen to have the passage open, may first become affected with this sort of hydrocele at an advanced age. Loder describes a hydrocele which had existed two years and a half in a man forty years of age, and which, as it became larger in the erect posture, and smaller in the recumbent, must have had a communication with the cavity of the abdomen.† A similar case fell under the notice of Hebenstreit.‡

The fact of the communication between the tunica vaginalis and abdomen sometimes remaining open, without any fluid accumulating in the scrotum, led Schreger to infer, that the water was not secreted by the peritoneum, but by the inner surface of the tunica vaginalis; an opinion, however, which becomes questionable, when the effects of the plan of treatment proposed by M. Viguerie, are considered; for a cure appears to be a frequent result of simply squeezing the fluid up into the belly, and hindering its descent again by pressure. I will not say, however, that Schreger is not right in the sentiment which he has delivered upon this point, because such pressure may possibly excite the adhesive inflammation, and thus obliterate the cavity,

\* Schreger, *Chirurgische Versuche*, b. i. pp. 7-10. 8vo. Nurnberg, 1811.

† Loder, *Chir. Beobacht.* b. i. p. 166.

‡ In Bell vom Wasserb. &c. p. 23.

in which the fluid was collected,\* as this author believes to be the fact.

The treatment which M. Viguerie adopted, consisted in pressing all the fluid back into the abdomen, and keeping it there with a truss, the pad of which made close pressure upon the abdominal ring. Nature then soon obliterated the communication between the abdomen and scrotum, and the patient was radically cured. This author published several cases, which were treated in this way with complete success; and Sabatier saw a boy, about six or seven years old, cured at Paris, in the same manner.† Schreger conceives, that Viguerie's mode of treatment might be rendered still more effectual, if the patient were to wear, in addition to the truss, a suspensory bandage, wet with spirit of wine, or the lotion composed of spirit of wine, vinegar, and the muriate of ammonia.‡

Viguerie's method, however, has not succeeded in the hands of every surgeon who has had occasion to try it: Desault tried it with considerable care, and, though the pressure was accurately maintained on the ring a long while, a relapse followed; and Schreger relates two other examples, in which the practice failed.§ Desault, not finding the above simple treatment always to have the desired effect, was induced to attempt the cure with a red wine injection. If any of the viscera protruded from the abdomen, he used to reduce them, and then tap the hydrocele in the common manner. At the same time, an assistant made pressure on the upper part of the sac, so as to shut up the communication between the tunica vaginalis and abdomen. The injection was then introduced, and allowed to remain a short time, after which it was let out, the scrotum covered with linen dipped in the injection, and a truss applied, both with a view of hindering any remains of the fluid in the tunica vaginalis from entering the abdomen, and of preventing the descent of the viscera.|| Although this practice is alleged to have been completely successful, and not to have occasioned any inflammation of the peritoneum, there can be no doubt, that, as it is a more severe mode of cure than that recommended by Viguerie, it ought to be practised only when the latter is found ineffectual. It would require also more facts than even Desault's experience probably furnished, to justify the conclusion, that the use of an injection, when a communication exists between the tunica vaginalis and abdomen, is quite exempt from the risk of peritonitis.

\* *Chirurgische Versuche*, b. i. pp. 18, 19.

† *Sabatier Médecine Opératoire*, t. i. p. 504, edit. 2. Paris, 1810.

‡ *Chirurgische Versuche*, b. i. p. 26.

§ *Ibid.* pp. 21, 22.

|| *Œuvres Chirurgicales de Desault*, t. ii. pp. 440-442.



## HYDROCELE OF THE SPERMATIC CORD.

In some instances, this is an œdematous affection of the whole of the cellular substance of the spermatic cord; in others, the fluid is confined to one or more cavities, within the sheath of the spermatic vessels. The first case is termed simply *hydrocele of the spermatic cord*; the second, *encysted hydrocele* of this part.

The first complaint is not a very common one, does not cause much inconvenience, unless when very large, is usually mistaken for a varix of the spermatic cord, or an adherent omental hernia, and seldom leads the patient to have recourse to any means of relief, but a suspensory bandage.

When the disease is of a moderate size, the scrotum appears quite healthy, except that, when not corrugated, it seems rather fuller, and hangs rather lower on that side, than on the other. The testicle can be distinctly felt, below this fulness, quite unenlarged. The spermatic cord feels considerably enlarged, as if its vessels were varicose, or there existed an irreducible epiplocele. The tumour is broader at the bottom than at the top. It seems to diminish when compressed; but immediately resumes its former size, when this pressure is discontinued, and as easily in a supine as in an erect posture. There is a very trivial uneasiness, not in the swelling itself, but in the loins.

The only mode of radically curing the disease, is making an incision into the tumour from the abdominal ring down to the testicle: but, unless the disease be very large and troublesome, the patient should be content with a suspensory bandage.

## ENCYSTED HYDROCELE OF THE SPERMATIC CORD.

This most frequently occupies the middle part of the cord, between the testicle and groin, and is generally of an oblong shape. It is so tense, that the fluctuation of the water within it cannot always be distinguished. It is perfectly circumscribed, occasions no pain, and generally presents a transparency, when a lighted candle is held behind it in a dark room. The testis and epididymis can be distinctly felt below the tumour, quite independent of it. The upper part of the cord in the groin is usually very distinguishable. As Mr. Pott observes, it undergoes no alteration from change of posture; it is not affected by coughing; nor are the functions of the alimentary canal disturbed by it.

Mr. Hey notices two forms of this disease, which are somewhat obscure. One is, when the hydrocele of the cord is situated near the abdominal ring, into which it admits of being pushed. The case, however, may be distinguished from a hernia, by the facility with which the vessels of the cord can be

felt when the tumour has descended again, and the finger and thumb are pressed in between it and the ring. Neither is there any guggling sensation produced when the part goes up, nor any interruption of the functions of the bowels, when it is down.\* Another cause of mistake proceeds from the swelling sometimes extending below the testicle, in which circumstance, the disease may be supposed to be a hydrocele of the tunica vaginalis. The surgeon, however, will not confound these complaints, if he only be careful to recollect, that, in the hydrocele of the tunica vaginalis, the testicle, being surrounded with a fluid, cannot be felt if the tumour be much distended. But in hydrocele of the cord, the testicle is on the outside of the cyst, and may be felt behind it.†

Infants and young persons are much more subject to this disease than adults; but it is much less commonly met with than hydrocele of the tunica vaginalis: Richerand contends, that, for one instance of encysted hydrocele of the cord, or of a collection of fluid in a hernial sac, there are on an average not less than two hundred examples, in which the fluid is contained

\* { We have witnessed a case of a large cyst, which having formed upon the cord above the abdominal rings, by a sudden descent gave rise to a train of symptoms, similar to those of a strangulated portion of intestine, and from which, by its appearance and character, it could not be distinguished. The case had been properly treated by a very judicious practitioner of the country, for several days, when Dr. G. M'Clellan was called in consultation. From the situation of the patient, it was deemed hazardous to delay the operation, and it was not until its performance that the true character of the disease was ascertained. The cyst, from the previous pressure, was very greatly thickened, and included the cord at its posterior surface, the cord below, and the body of the testicle itself was much enlarged, and in a diseased state; so much so, that on a careful examination, and with the consent of the patient, it was deemed prudent to remove the whole of the diseased parts. The patient speedily recovered. In addition to the remarks of Mr. Cooper in this chapter, we would note, that where one or more of the cysts have been destroyed by the operation, others are liable, afterwards, to form on the course of the cord. Several separate cysts, of different sizes, may exist at the same time along the cord, each of which are liable to become enlarged. We have seen cases where the whole length of the spermatic cord, below the external abdominal ring, was filled with them; several of a small size within the folds of the epididymis, and some of the size of filberts attached closely to the body of the testicle itself. In such cases, we can hardly hope for more than a partial relief, except by removing the whole of the diseased cord and testicle. In a case treated by Dr. G. M'Clellan, some years since, on making an incision into the scrotum, several small vesicles, attached to each other by small pedicles, projected through the wound, and when this was enlarged, a large quantity of these hydatiginous cysts, strung together like grapes to their stems, were drawn out and removed from the cord. The case was permanently cured. }

† Hey's Practical Observations in Surgery, p. 558, edit. 3.

within the tunica vaginalis.\* In children, the fluid may often be dispersed by aperient medicines and fomentations. If it should not yield to this treatment, a small puncture, sufficient to evacuate the fluid, commonly produces a cure. In adults, in whom the disease is generally more obstinate, it is sometimes requisite to make an incision through the whole length of the tumour. I have seen several instances, in which a cure was effected with the red wine injection, after the fluid had been let out by means of a very small trocar. Mr. Hey had a particular method of operating: he grasped the integuments and spermatic cord in his left hand, at the posterior part of the tumour, which he made project with the skin tightly drawn over it. He then divided the skin and fibres of the cremaster, and the subjacent cellular substance, &c. by repeated gentle strokes of the knife, till he arrived at the cyst itself, which was generally quite transparent. The projection of the cyst increased, as the parts which covered it were divided; and, when it was laid bare, nearly the whole of it protruded. The cyst was then punctured with a lancet, and all that had appeared perfectly transparent before the puncture was made, was cut off with the knife or scissors; but the posterior part of the cyst was left untouched. Mr. Hey now closed the integuments with a suture, without which they were apt to shrink back, and leave the cord projecting out of the wound. A poultice was then applied, till the inflammation following the operation had subsided.† This mode of treatment is not very dissimilar from that advised by Bertrandi; but he limited it to cases, in which the tumour was ancient and large; in other instances, he preferred a seton, or tent, as the means of cure.‡ Sir Astley Cooper mentions examples, in which an injection failed to produce a radical cure: he gives a preference to a seton of a single silk, introduced through the swelling with a curved needle.§

\* Nosographie Chir. t. iv. p. 262, edit. 4.

† Op. cit. p. 559.

‡ Bertrandi, *Traité des Operations de Chirurgie*, pp. 188-191. 8vo. Paris, 1784.

§ Lectures, vol. ii. p. 113.

## CHAPTER XXXVIII.

## HÆMATOCELE

SIGNIFIES a swelling of the scrotum, or spermatic cord, occasioned by blood.

The disease is of four kinds: two of which have their seat in the tunica vaginalis; one within the membrane investing the spermatic vessels; and the fourth in the cellular substance of the scrotum.

1. In letting out the water of a hydrocele, a vessel, that will bleed a good deal, may happen to be wounded; an accident sometimes immediately indicated by the fluid discharged being tinged with blood. After the operation, the blood insinuates itself partly into the tunica vaginalis, and partly into the cellular substance of the scrotum, so as to form, in a very short time, a tumour nearly equal in size to the original hydrocele. In other instances, the water which flows out is but little reddened, and what has happened is not suspected till the cannula is withdrawn, when blood gushes out of the puncture. This form of hæmatocele is more likely to happen when the hydrocele is large, and has been opened with a lancet.

2. Another species is when the blood is effused in consequence of the spontaneous rupture of a vessel after the operation, and it is entirely confined to the cavity of the tunica vaginalis. In this instance, the fluid of the hydrocele, at the period of its discharge, is not tinged with blood. Hæmatocele, from this latter cause, is often observed in old men who have been long afflicted with hydroceles, which have been repeatedly opened.\*

These two forms of the disease constitute what is usually understood by the term *hæmatocele*, which is distinguishable from hydrocele by its weight, its want of transparency, its obscure fluctuation, and its having been generally produced by a blow.†

3. The third arises from a rupture of a branch of the spermatic vein.

4. The fourth case is of the same nature as ordinary effusions of blood in the cellular substance of other parts of the body. Like them, it is frequently caused by blows, and it yields to

\* Jamieson, in Medical Essays of Edinburgh, vol. ii. art. 14.

† Sir A. Cooper's Lectures, vol. ii. p. 114.



similar treatment. I have sometimes known it take place to a considerable extent after lithotomy done with the gorget; and Richerand relates an example, in which a very large effusion of blood in the loose cellular membrane of the scrotum and perinæum followed castration.\*

The two first cases may generally be cured by opening the cavity of the tunica vaginalis, removing the effused blood, and applying a poultice. If the quantity of blood were very small, perhaps, discutient applications and purgatives ought first to be tried.

The species of hæmatocele, arising from a rupture of the spermatic vein, is generally caused by great exertions, contusions, &c.

When the case is clearly distinguished from a hernia, attempts must be made to promote the absorption of the extravasated blood, by applying the lotion, composed of spirit of wine, vinegar, and muriate of ammonia. The patient, if young, or not too much reduced, should also be bled and freely purged. A bag-truss is to be worn, and the patient kept in bed. When, under this treatment, the swelling, instead of diminishing, increases in size, the bag-truss may be tightened, and compresses laid upon the scrotum, wet with the coldest water that can be procured.†

If the case should obstinately resist all these means, a thing which seldom happens, an incision must be made into the tumour, and the bleeding point being discovered, it should either be tied, or stopped with a dossil of lint. According to Richter,‡ when the hemorrhage is found to proceed from one of the trunks of the spermatic veins, castration is indispensably necessary; but, as the bleeding from the largest veins may generally be stopped by pressure, I should be reluctant to let a patient lose a testicle, merely on account of the accidental rupture of one of its veins.

In the case of blood effused in the cellular membrane of the scrotum, a free incision is the best practice, when the swelling is excessive, or resists discutient means; but, in other instances, it will be sufficient to keep up the scrotum with a suspensory bandage, apply the lotio ammoniæ muriatæ, and exhibit two or three purgative draughts.

Should inflammation of the parts arise, venesection, leeches, and febrifuge medicines, would be proper, with cold evaporating lotions; or, if suppuration were unavoidable, an emollient poultice.

\* Nosographie Chir. t. iv. p. 260, edit. 4.

† Richter, Anfangsgr. der Wundarzn. b. vi. p. 134.

‡ Ibid. p. 135.

## CHAPTER XXXIX.

## DISEASES OF THE TESTICLE, SARCOCELE, &amp;c.

SARCOCELE is a term applied to every chronic, fleshy enlargement of the testicle. Hence, not only several kinds of sarcoma, affecting this body, and noticed in the chapter on that subject, acquire this name, but also some diseases of the testicle generally considered to be scrofulous; even fungus hæmatodes, scirrhus and cancer, when situated in this part, have been improperly blended with numerous other morbid affections, and comprehended under one common title, *sarcocele*. When the disease is attended with an accumulation of water in the cavity of the tunica vaginalis, it is not unfrequently named *hydro-sarcocele*.

The induration and swelling of the testicle, remaining after a simple inflammation of that organ, are not usually called sarcocele, as they rarely increase, or give any pain or trouble. The swelling of the testis also, arising in patients affected with syphilis, independently of gonorrhœa, or any disease of the urethra, is seldom of a dangerous or malignant nature; and the same remark may be made upon most indurations confined to the epididymis, which are generally much less disposed to end in a disease subversive of the natural structure of the testicle, than chronic swellings of the body of this gland. Still there are particular indurations, commencing in the epididymis itself, which are liable to change into a disease that will ultimately destroy the patient, unless the part be removed.\*

## OF COMMON SARCOCELE.

This disease is of the same nature as the ordinary vascular sarcoma, described by Mr. Abernethy, and treated of in the first part of this book. The testis becomes larger than natural; and this increased size, which, in some cases, is inconsiderable, in others, attains a degree, in which the part affected is as large as two fists. While the tumour is of moderate dimensions, the shape of the testis is partly retained; the swelling being oval and flattened at the sides, with its larger end turned upward and forward, and its smaller directed downward and backward. Its weight is very considerable, in comparison to its size; and

\* See Pott's Chirurgical Works, vol. ii. pp. 458-461. 8vo. Lond. 1808.

it is its nature to remain a long while indolent, giving but little pain, except it be left unsupported, when from the dragging of the spermatic cord, more or less annoyance is produced. The scrotum is of its natural colour, without any augmentation of its temperature, or any signs of fluctuation. At first, the spermatic cord is unaffected, and of course the swelling does not extend quite up to the abdominal ring: but, after a time, the disease generally extends higher up, and the cord itself becomes enlarged. However quiet and indolent a common sarcocèle may be in its incipient stages, and even for years, the possibility of its assuming a more painful and malignant nature should never be forgotten, because it is a fact, that ought always to be allowed to weigh in considering the propriety of persevering in attempts to save the part.

#### SCROFULOUS DISEASE OF THE TESTICLE.

The testicle is sometimes converted into a truly scrofulous mass, being enlarged, and when cut into, presenting a whitish or yellowish coagulated matter, mixed with pus.

The complaint is not attended with so much pain and induration as a scirrhus disorder of the testicle; nor does it produce any unfavourable state of the health.

#### FUNGUS HÆMATODES OF THE TESTICLE.

This incurable disease, called likewise *medullary sarcoma*, or *soft cancer* of the testicle, is by no means unfrequent, and particularly demands the earnest attention of the surgeon, not only on account of its fatal character, but also because it is a distemper very insidious in its attack, and peculiarly liable to be mistaken for a common hydrocele. It is described by Dr. Baillie under the name of the *pulpy testicle*. The testicle (says he) is sometimes much enlarged, and converted into an uniform pulpy matter, in which its natural structure is entirely lost. This sort of change has been sometimes mistaken for scirrhus, but it is very different from what is called scirrhus in other parts of the body, and what is also found in the testicle itself.\*

According to the excellent description given of it by Mr. Wardrop, fungus hæmatodes of the testicle is mostly seen in youngish persons under the age of thirty. In some cases, its origin is attended with a tumour in the epididymis. The progress of the disease is very slow, and, as the swelling of the gland increases, the tumour retains an oval, or globular form, and it becomes difficult, if not impossible, to distinguish the

\* Baillie's Morbid Anatomy of some of the most important Parts of the Human Body, p. 350. 8vo. Lond. 1807.

body of the testicle and epididymus from one another. The pain of the disease is generally so trifling as to excite little alarm, and there is no inequality, no hardness in the gland, nor any change in the structure of the scrotum. When the testicle has increased considerably in bulk, it becomes remarkable for its softness and elasticity, and produces a sensation as if it contained fluid.\* Hence, the disease has often been mistaken for hydrocele, and punctured: nay, so deceitful is the feel of the tumour, that cases have occurred, in which the surgeon was so persuaded of the presence of fluid, that he was not content with thrusting a lancet into the swelling once, but after a few days, actually repeated the same pernicious experiment.†

I know of no writer, who has pointed out the distinguishing marks of these two very different diseases, so well and correctly as Mr. Wardrop. The want of transparency in the tumour, (says he,) is one appearance in fungus hæmatodes of the testicle, which might be expected to lead to an accurate diagnosis between it and hydrocele; but, as there are many collections of water in the vaginal coat, of a dark colour, and sometimes even of blood, and as the vaginal coat is often very much thickened, this cannot be always regarded as a diagnostic symptom. Fungus hæmatodes of the testicle, when of considerable bulk, though resembling many of the more frequent varieties of hydrocele in shape, yet, on inquiry, will not be found to have had a similar progress. In hydrocele, the water begins to collect at the bottom of the scrotum, and the testicle may generally be distinguished at the posterior part, until the tumour has acquired a very large size; whereas, in fungus hæmatodes, the disease commences in the body of the testicle, or in the epididymus, and the whole gland gradually enlarges. The tumour, too, in hydrocele, is accurately circumscribed towards the ring, whereas in fungus hæmatodes, there is a gradual swelling, or fulness, extending up from the testicle along the spermatic cord. This fulness is described as being very different also from the unyielding hardness of a scirrhus affection of the part. In judging of the nature of the disease, the comparative weight of the swelling, to that of a hydrocele of equal bulk, is likewise to be considered.

Fungus hæmatodes of the testicle, when large, sometimes become hard at some points, and soft at others, where the swelling seems as if it were about to break. As far as Mr. Wardrop's experience goes, it is not common for the scrotum to give way, and a fungus to protrude; but, if the patient live

\* Wardrop, Observations on Fungus Hæmatodes, or Soft Cancer, pp. 124-126. 8vo. Edinb. 1809.

† See Practical Observations in Surgery and Morbid Anatomy, by John Howship, p. 325. 8vo. Lond. 1816.



long enough, the disease may follow such a course.\* When this happens, some points of the scrotum become discoloured, and more prominent than others, inflame, ulcerate, and discharge a small quantity of matter, and out of the new-formed openings the fungus mass shoots with more or less rapidity. Hemorrhages now take place from the excrescence, from the slightest causes. The disease, which, in its commencement, was not very painful, is attended in a more advanced stage with severe pain shooting up the spermatic cord to the loins. Hectical symptoms gradually come on; the absorbents, glands in one or both groins, along the spermatic cord, at the side of the aorta and vena cava, and in various situations within the abdomen, become converted into a pulpy substance, similar to that of the testicle; and the patient at length falls a victim to a disease, which appears in most instances to be rather of a constitutional, than a local nature. In many cases, experience proves, that vestiges of the disease may be traced in a variety of other parts of the body at the same time, the kidneys, liver, brain, &c. When the fungus projects through the skin, the patient's fate is sometimes accelerated by repeated bleedings.† On examination of the testicle, after its removal from the body, its natural texture appears entirely lost, and it is found converted into a soft pulpy matter, not unlike the medullary substance of the brain.

## SCIRRHOUS TESTICLE.

The testicle is often converted into a hard mass, of a brownish colour, generally intersected by membranes, and sometimes containing cells, filled with a sanious fluid.‡ This is the truly scirrhous testicle, which is attended with great hardness, severe pains darting along the spermatic cord to the loins, and an unequal knotty feel. The health is generally much impaired.

Sooner or later, the scirrhous induration extends from the epididymis upward along the spermatic cord, even within the abdominal ring. In the latter circumstance, the lymphatic glands in the loins usually become diseased; and this extension of mischief, together with the impossibility of removing the whole of the diseased cord, too frequently deprives the patient of every chance of recovery.

It is now well known, that various sarcomatous enlargements of the testicle, at first quite indolent, and exempt from pain, and every alarming complication, such as swelling and induration of the cord, tumours of the inguinal glands, and swellings within

\* See Practical Observations in Surgery and Morbid Anatomy, by John Howship, p. 129. 8vo. Lond. 1816.

† Ibid. p. 331.

‡ See Baillie's Morbid Anatomy, pp. 352, 353, edit. 2.

the abdominal parietes, are capable of assuming, in a very sudden manner, a malignant and cancerous tendency; and that sometimes the scirrhus induration of the cord makes rapid progress upward. When these changes have taken place, attended with severe hectic symptoms, extreme emaciation, a pallid wan face, and a tendency to anasarca, no measures which the healing art can suggest, will now save either the diseased part, or the patient's life. Hence, that surgeon acts with prudence, who recommends an early extirpation of every testis that is incurably diseased, and entirely deprived of its original organization.

As leaving a man with a malignantly diseased testicle, quite unassisted, to meet his lingering fate, is a very serious step, all surgeons ought to be well apprized, that every enlargement of the spermatic cord is not of that particular description, which amounts to a prohibition of the operation.

One enlargement of the cord is perfectly free from malignancy, and proceeds either from a varicose dilatation of the spermatic veins and arteries, or from a collection of fluid in the membrane, enveloping the said vessels. In this case, the cord, though enlarged, is smooth, soft, and compressible; the whole process is loose and free, will easily permit the fingers of an examiner to go all round it, and to distinguish the parts of which it is composed; and it is not painful when touched.

In that morbid state of the cord, in which the operation is forbidden, the part is unequally hard and knotty; the parts, of which it consists, are undistinguishably blended together; and handling it occasions pains, shooting up to the loins and back. In cases of decided fungus hæmatodes, any enlargement of the cord is fatal to the success of the operation.

I should be sorry, if the foregoing observations were to deprive a single individual of the chance of avoiding a severe operation, and preserving an organ, to which, in general, the highest value is attached. That there are some chronic enlargements of the testicle, which may be resolved, is a truth, of which experience must have convinced the generality of surgeons. The scrofulous induration, and several other swellings of this organ, which are very imperfectly understood, I believe, may sometimes be benefited, and even entirely cured, just like some analogous affections of the breast. Hence, though I am an advocate for the early performance of castration in cases of sarcocele, where there is reason to suppose the disease so far advanced, that the organization of the testicle is totally destroyed, or where internal and external remedies have been tried a certain time in vain, this sentiment does not incline me to recommend the operation for other examples, in which the disease is quite recent, and no plan of treatment has been fairly

tried. What makes this remark still more worthy of attention, is the important fact, that every chronic enlargement of the testicle, though it be of long standing, does not necessarily imply an incurable change of structure in the part; for, if this were the case, the disease considered by Pott, and others, as the venereal sarcocele, would not admit of relief, which daily experience fully contradicts. This affection of the testicle is described as being independent of a gonorrhœa, or of any disease in the urethra; seldom an early symptom; and either immediately preceded, or accompanied by some other appearance plainly venereal. It has neither the inequality, nor darting pains of scirrhus, and always gives way to a mercurial process, properly conducted.\* The disease of the testicle, usually considered as scrofulous, may sometimes be diminished by administering internally cicuta and calomel, and applying to the scrotum, lotions, or poultices, made with sea-water; but the most powerful medicine is unquestionably iodine, which should be used both internally and externally. Several other cases yield to a course of mercury; leeches being daily applied to the scrotum, or frictions made on the part with camphorated mercurial ointment. In every case, the diseased organ must be well supported by means of a suspensory bandage. According to Mr. Ramsden, that species of sarcocele which he called sclerocèle, admits of relief, by removing with bougies the morbid irritability of the urethra, with which he considered its origin to be frequently connected.†‡

The same kind of case is noticed by Sir Astley Cooper, under the name of the *simple chronic enlargement* of the testis, which, he observes, may be cured by confining the patient in bed a month; giving two, or three grains of calomel, and a grain of opium, night and morning, until the mouth is sore, which is to be kept moderately so for a month; applying leeches, or opening the veins of the scrotum with a lancet, twice a week; applying to the scrotum equal parts of the camphor mixture and vinegar; and giving every fourth morning an active dose of the infusion of senna with salts. Then, if the urethra be diseased, the silver sound is to be employed.§ When the disease has advanced to suppuration, however, the testis will sometimes require to be removed.

#### FUNGUS OF THE TESTICLE.

There is a particular affection of the testicle, in which a fungus grows from the glandular substance of this body, and, in

\* Pott's Chirurgical Works, vol. ii. p. 393. 8vo. Lond. 1808.

† See Pract. Obs. on the Sclerocèle, &c.

‡ See NOTE E.

§ Sir A. Cooper, Lectures, vol. ii. pp. 146-148.

some cases, from the surface of the tunica albuginea. This excrescence is usually preceded by an enlargement of the testicle, in consequence of gonorrhœa, a bruise, or some species of external violence. A small abscess takes place and bursts, and, from the ulcerated opening, the fungus gradually protrudes. In some instances, the disease is accompanied with great irritability of the urethra, or strictures.\*

If, when the inflammatory affection of the testicle has subsided, the substance of this body should not be much indurated or enlarged, it is a very rational practice to endeavour to extirpate the fungus and diseased portion of the testis, without removing the whole of this body.

The object may sometimes be fulfilled by destroying the fungus with the lapis infernalis. But, at all events, the fungus, and whatever superficial portion of the substance of the testicle is diseased, might be removed with a knife. Such an operation I once saw performed in St. Bartholomew's Hospital, by the late Sir James Earle, and the part healed up in the most favourable manner. I have also seen the fungus successfully extirpated with a ligature; a method, which answered in the practice of Mr. Wadd: in one instance, however, as the fungus began to rise up again, its destruction was completed with caustic.†

Though this seems to be a judicious practice, when the organization of a considerable part of the testicle is not totally subverted by disease, and, particularly, when the fungus grows entirely from the tunica albuginea; yet, if the whole substance of the testicle were so diseased, that the part would still be an useless and troublesome mass, though the fungus were removed, the surgeon ought undoubtedly to perform castration. A surgeon is not, however, hastily to advise this operation in every instance of fungus of the testicle, attended with swelling and induration of the part. Both the cases recorded by Mr. Wadd were complicated with induration and enlargement of the testicle: yet, after the fungi had been removed, and the irritability and strictures in the urethra cured with bougies, the sarcocele underwent in one case material amendment, and, in the other, the enlargement, after being considerably reduced during the use of bougies, was entirely removed with the aid of mercurial friction.‡

An interesting paper on this disease, illustrated by cases, was published by Mr. Lawrence; and as it conveys an accurate idea of the real nature of the case, I would recommend it to the attention of every practitioner.§ In the best modern works,

\* Wadd's Cases of Diseased Bladder and Testicle, pp. 45 and 47.

† Op. et loc. cit.

‡ See NOTE F.

§ See Edinburgh Medical and Surgical Journal, vol. iv. p. 257.



published abroad, every disease of the testicle, exhibiting the appearance of a fungus, is indiscriminately condemned to castration; and English surgeons have often advised the same practice, in consequence of not understanding the true character of the complaint. This disease, however, must not be confounded with other fungi, which sometimes arise from the testicle, in cases of cancer and medullary sarcoma of this organ, and which, if the cord be but little affected, the glands and viscera not obviously diseased; and the health not too far gone, require castration, as the only possible, and yet uncertain, means of relief.

HYDROCELE, WITH DISEASED TUNICA VAGINALIS, LIABLE TO BE MISTAKEN FOR SARCOCELE.

The tunica vaginalis sometimes becomes very much thickened, indurated, and even cartilaginous, at the same time that its cavity is filled with fluid. Schmucker met with hydroceles, which felt as hard as a sarcocele; and Saviard states, that they are sometimes attended with the hardness of horn. The feel of the tumour may deceive the surgeon, and make him suppose the case a hydro-sarcocele, while, in fact, the testis itself is perfectly sound. Forestus mentions a patient, who had an indurated swelling of the testis, distending the scrotum, like a scirrhus: for five years it continued to get larger; and every surgeon, who saw it, regarded it as a sarcocele. At length, under the use of emollient applications, it became softer, and burst, when a large quantity of water was discharged, and the swelling of the scrotum subsided. Here was an instance of hydrocele, probably attended with a thickened tunica vaginalis: a disease which might have been cured much sooner, had it not been for the mistake in the diagnosis. I have seen several preparations of this disease in anatomical museums, and, in general, castration had been injudiciously performed. What makes a mistake of this kind still more likely to happen, is the circumstance of a hydrocele sometimes deviating from its usual character by being attended with pain. An experienced surgeon assures us, that he has seen instances, where, from the enlargement and the painful sensations of the part, it had been thought advisable to extirpate the testis, on presumption of that being the part aggrieved; but, upon making an incision through the scrotum and tunica vaginalis, a quantity of lymph suddenly gushed out; the testis presented itself of its natural size and appearance: thus, the nature of the disease was accidentally manifested, and a cure fortunately effected, without the operation of castration. Hence, where the disease is complicated, and doubtful, a puncture should always be made in the tumour, just before proceeding to remove the testis; an experiment that will

give but very little pain, and sometimes save the patient from castration; while the latter operation, if found the only means of cure, need not be delayed on account of the previous step, that has been taken as a measure of precaution.\*

A hydrocele, with a considerably thickened tunica vaginalis, is a case, for which, as I have related in the chapter on hydrocele, the radical cure by incision is yet regarded by some authors as the most eligible; because the surgeon is thereby enabled to cut away the hardened membrane, and to ascertain, with his own eyes, the actual state of the testicle. I have explained, however, that the necessity of cutting away the thickened tunica vaginalis is not generally admitted by surgeons in England. Mr. C. Bell positively rejects the doctrine; and the late Sir James Earle adduced cases, which appeared to be fair proofs, that hydroceles may be generally cured by an injection, though the tunica vaginalis be a good deal thickened. Nay, Desault goes further, for he questions the accuracy of the common advice, never to attempt a radical cure with the injection, when the testis is enlarged: on the contrary, he urges as a maxim in practice, that those incipient swellings of the testis, in which this organ has not yet acquired the weight that is characteristic of a scirrhus, far from being an impediment to the operation for the hydrocele by injection, are cases which particularly require such treatment, as the means of curing at once both the disease of the tunica vaginalis, and of the testicle. His remarks are corroborated by several interesting cases, in which the practice was tried with success. Desault, at the same time, cautions surgeons against making a trial of this plan, when the testis is scirrhus, and in the instances in which he himself adopted the plan, though the testis was considerably enlarged, it was not indurated; a circumstance demanding especial attention.†

#### SARCOMATOUS THICKENING OF THE SCROTUM.

Another disease, liable to be confounded with sarcocele, is a great and sometimes an enormous thickening of the scrotum itself. This case is more frequently met with in warm, than cold, or temperate countries; but it has been seen both in this country and in France.‡ Though the scrotum may attain a magnitude which is truly surprising, the testes, concealed in the mass of new-formed matter, remain perfectly sound; and the principal grievances depend upon the manner, in which the patient's fitness for every active employ, and even his ca-

\* See Warner's Cases in Surgery, p. 291, edit. 4.

† See Œuvres Chir. de Desault, t. ii. pp. 443-448.

‡ See the case of M. Delacroix in Richerand's Nosographie Chir. t. iv. p. 315, edit. 4.

pability of walking, riding, and taking exercise, are destroyed by an enormous swelling, which sometimes weighs nearly a hundred weight. The only mode of relief consists in cutting the diseased scrotum away, in doing which, the operator is to avoid injuring the spermatic cord and testicles.

## CHAPTER XL.

### CASTRATION.

IN some cases of sarcocele, the performance of the operation is optional; in some, absolutely and immediately necessary; in others, altogether unfit to be attempted, as presenting no chance, either of temporary, or permanent advantage.

When the plans of treatment which I have spoken of, as meriting trial in cases of sarcocele, are found to be ineffectual, the surgeon should generally have recourse to the operation, because the patient will thereby be freed, not only from the pain and inconveniences arising from the magnitude and weight of the tumour, but also from the danger of its suddenly changing into a malignant form of disease. It is true, the records of surgery furnish us with many instances, in which a sarcocele continued quiet and stationary the whole of the patient's life, whence it might be inferred, that, if the preceding advice were followed, the operation would often be done unnecessarily, and a testis removed which would never occasion serious trouble. But, in opposition to this consideration, it should be remembered, that as an irrecoverably diseased testis is a perfectly useless mass, its removal subjects the patient to no important loss, while it delivers him from all the inconvenience occasioned by the size and weight of the swelling; and that as it is never possible to know beforehand, how long the disease will remain quiet and stationary, the operation is advisable on the ground of its freeing the patient from every apprehension and risk of an unfavourable change.

It must be acknowledged, that there are some cases, in which the operation may be safely postponed; as, for instance, when the disease is the consequence of a recent inflammation of the testis, or, when it is of that kind which Pott and some other writers denominate (with what accuracy I will not pretend to say) the *venereal sarcocele*. The *scrofulous* sarcocele is also another form of the complaint, little apt to degenerate into a dis-

ease, which has itself much effect upon the health, or any great tendency either to become actively painful, or to extend suddenly up the cord, and render castration unavailing. This sarcocoele is itself only a symptom, or effect, of a specific constitutional disease, for the relief of which, the removal of the testis can never do any material good, except inasmuch as the part may sometimes contribute in a secondary manner to the impairment of the health, by causing mental anxiety, trouble, pain, and confinement. Unfortunately, however, when there are no other manifest traces of scrofula present, the diagnosis of this kind of sarcocoele is not always sufficiently plain in practice; and, frequently, amidst the uncertainty of its truly indolent character, a perpetual alarm is felt, lest it should undergo any sudden unfavourable change. With respect to sarcocoeles in general, I may join Richter\* in asserting, that, when the swelling is small, the hardness not very great, and the disorder has proceeded from an external cause, the operation should not be hastened; and, in every case, where it is advisable to defer the removal of the part, the inconvenience, produced by its size and weight, may be considerably lessened by the use of a bag-truss.

The operation should never be practised when the constitution, or any of the viscera, participate in a similar affection to that situated in the part about to be removed. Thus, in fungus hæmatodes of the testis, where the disease is rarely, perhaps never, limited to this organ, castration is often forbidden, on account of the obvious inutility of removing one part of the distemper, while more than enough to destroy the patient must still be left behind, in situations quite inaccessible to the hand or knife of the surgeon. The general account of this destructive disease, contained in the first part of the present work, renders it unnecessary here to enter into any recapitulation concerning the manner, in which it commonly invades numerous parts together, the testes, absorbent glands in the course of the great vessels, the kidneys, liver, lungs, and even the brain and its membranes. How useless any attempt to relieve the patient by castration must be, when the symptoms render it certain, that the disease has extended to the glands and viscera, is indeed a fact, too evident to require any comment. But, notwithstanding the correctness of these generally received doctrines, I would not presume absolutely to forbid the operation, though the case were fungus hæmatodes, provided the general appearance of the patient were healthy, without any manifest signs of disease in the glands, spermatic cord, or viscera. At the same time, I have never known a lasting recovery follow the removal of a testis

\* Anfangsgr. b. vi. p. 146.



affected with fungus hæmatodes, though the patient at the time of the operation appeared to be in other respects healthy. The complaint frequently returns in the loins and spermatic cord.\* An example, in which a testis thus diseased was removed from a gentleman, in whom no other vestiges of this or any other complaint could be traced before the operation, was communicated to me by my friend Mr. Lawrence, who was himself the operator, and whose examination of the part after its removal, left him convinced, that the disease was a true fungus hæmatodes. Here the wound healed up very well; but the patient was soon afterwards carried off by the effects of disease in his chest.

With respect to what is termed the scrofulous sarcocele, it would also be condemned as unfit for the operation by the maxims already premised, because here the whole constitution must be supposed to be unsound. Yet, I believe, this case must often be an exception to the rule delivered, of not resorting to castration, unless the disease be local, and capable of entire removal. A scrofulous sarcocele, though no doubt complicated with a constitution prone to evince other effects of that disease, is sometimes unaccompanied with any other discoverable defect, or alteration of structure in other parts of the body. In this circumstance, if the disease of the testis be a source of grievance, castration should be performed; for experience fully proves that the wound heals up very favourably after the removal of a scrofulous part, and there is no certainty that any scrofulous disease will afterwards show itself in other organs. If it should not, the patient will be permanently cured; and if it should, the operation itself will have no share in contributing to the fresh attack, which may also be both more tolerable and curable than the sarcocele. In short, a scrofulous testis, when attended with great annoyance and inconvenience, (which it sometimes is not, on account of its indolence,) is circumstanced, with respect to castration, exactly as a scrofulous disease of a joint is with regard to amputation.

In considering the propriety of castration in cases of sarcocele, nothing can be wiser than the general maxim, not to employ the knife, if there be any traces of disease in the viscera; and therefore it may be inferred, that the operation will not answer when the patient has very frequent attacks of colic pains, a pallid leaden-coloured countenance, indigestion, loss of appetite, frequent purging, a hard belly, or any distinct and separate indurations about the abdomen. In cases of fungus hæmatodes, or soft cancer of the testis, the kidneys often partake of the disease; and hence, the prudence of always making careful inquiry into the state of those organs, before venturing to

\* Sir A. Cooper, *Lectures*, vol. ii. p. 136.

propose the operation. It is to be recollected, however, that the weight of the enlarged testis frequently produces in the loins extremely painful sensations, which might be mistaken for symptoms of diseased kidneys, if the difference were not indicated by the pain always diminishing, when the scrotum is well supported in a bag-truss, or the patient keeps himself in the recumbent posture. In such cases, the state of the urinary secretion would also afford useful light.

Sometimes there are swelled glands in the groin, or near the abdominal ring, which are highly unfavourable, whenever the disease of the testis consists of any species of sarcoma, characterized by malignancy, and a disposition to extend to other organs.

In cases of sarcocele, attention should also be paid to the state of the thoracic viscera; for experience proves, that various complaints of the chest frequently precede or follow the origin of a sarcocele, and seem to have a connexion with it. In fact, in cases of soft cancer of the testis, the structure of the lungs is often found interspersed with pulpy, medullary tumours, the fatal nature of which is proved by the dissection of the very patient, in whom this morbid appearance is seen. Hence when the patient has a constant dry cough, shortness of breath, and irregular pain in the chest, and especially when these symptoms attend a fungus hæmatodes testis, the operation is unadvisable.\* The success of castration very much depends upon the state of the spermatic cord; for here it is a point of the first-rate importance to remove every particle of the disease—every thing which appears unsound and indurated. This can easily be accomplished when the disease is confined to the testis and epididymis, the cord being unaffected. But when, as often happens, the latter part is in the same state as the testis, hardened and enlarged, the operation is improper. If the disease of the cord, however, were not to extend quite up to the ring, and its upper portion were still sound, it would yet be practicable to remove all the parts affected, by cutting the cord through where it is quite healthy, and the operation be justifiable. But it is not to be denied, that in such a case, the event is subject to great uncertainty, not so much on account of the commonly feared danger of cutting the cord through near the ring, as because the extension of the disease up the cord is always a ground for apprehending that the complaint may not now be altogether local.

However, unless the case be fungus hæmatodes, it is only when the cord is truly scirrhus, that is to say, thickened, hardened, knotty, and painful, that it becomes an impediment to the operation; and, when its enlargement is owing merely to a

\* Richter, Anfangsgr. b. vi. p. 147.

varicose dilatation of the vessels, or an effusion of fluid in the cellular membrane of the part, the circumstance should not prohibit the use of the knife. Both these last states of the spermatic cord are noticed in the preceding chapter, and may always be distinguished from the scirrhus alteration of the part, by their greater softness, and their diminishing when the patient keeps himself in a horizontal position.

According to a modern writer, the circumstance of the scrotum being diseased in the case of a scirrhus testicle, is nearly as unfavourable to the success of the operation as disease of the cord,\* the distemper sometimes recurring in the skin. However, there is this difference, that we always have it in our power to cut away every part of the scrotum which may be affected, while, in the case of scirrhus affection of the cord, it is sometimes impossible to follow the disorder to its highest point.

Castration is one of the most simple, and yet one of the most painful operations in surgery, especially when practised according to the old method, in which it was the custom to include in the ligature all the vessels and nerves of the spermatic cord. At the moment of doing this, the patient was put to excruciating torture; such suffering, indeed, as few could endure without complaint, however great their fortitude.†

In the removal of a diseased testicle, the first thing is the incision through the integuments; it should commence a little above the place where the operator purposes to divide the spermatic cord, and be continued down nearly to the bottom of the scrotum. There is an advantage, indeed, in letting the cut extend quite down to this point, because this free division of the skin will afterwards tend in a very essential manner to prevent those lodgments of matter, which often seriously retard the cure. The first incision through the integuments will of course divide some of the branches of the external pudendal artery, which arise from the crural, and if they bleed profusely, the best plan is to secure them at once with small silk ligatures, the ends of which may be cut short, in the manner practised by M. Roux.‡ The second object is to expose and detach the spermatic cord from the surrounding fat and cellular membrane, which may be easily done by making a short incision on each side of it, at the point where it is intended to

\* C. Bell, *Operative Surgery*, vol. i. p. 223.

† Le Dran appears to have entertained a just aversion to this painful and unnecessary plan: "Of the several parts of the cord, (says he,) none but the artery will bleed; why then should the cremaster muscle, the vas deferens, and the nerve, be tied with it? We are sensible, that convulsive motions have ensued from this method of making the ligature upon them all." *Operations in Surgery*, p. 147, transl. by Gataker, edit. 2.

‡ See *Sketches of the Medical Schools of Paris*, by John Cross, p. 141. 8vo. Lond. 1815.

divide it, and then, having raised it a little up, continuing the dissection of it from the subjacent parts. When its detachment is sufficiently completed to allow it to be conveniently taken hold of, and lifted up, between the thumb and forefinger of the operator's left hand, this second step of the operation is accomplished. It is a business which should never be done in a hasty and slovenly way; for it is possible for a portion of omentum and a hernial sac to put on somewhat the appearance of thickened cellular membrane, in which circumstance, a careless surgeon would be apt to cut the protruded parts in the dissection, or even divide the sac at the time of dividing the cord; an accident which has really happened.\* The third object is the division of the cord; a most important part of the operation. The chief caution to be observed here, is to make the incision through the part higher than the extension of the disease; for, if this be neglected, the patient will derive no effectual relief from the operation, and the wound will either not heal up at all, or if it heal at first, will soon break out again. The way of proceeding also in this part of the business, is different with different surgeons. Some operators, previously to cutting the cord through, pass a ligature under it with an aneurism needle, tie it with great firmness, and, through an immoderate apprehension of bleeding, spare neither the nerves, the vas deferens, nor the cremaster. The cord is then divided below the knot of the ligature, with a curved bistoury. This is the old method of operating; a method productive of the greatest agony to the patient, and now happily rejected by every humane and skilful surgeon. Others make a slight deviation from the foregoing mode of tying the whole cord, and, aware of the inutility and pain of including the vas deferens in the ligature, and of the facility with which this vessel can be distinguished at the back of the cord, by reason of its firm feel, they pass the ligature between it and the rest of the cord, over the front of which the knot is made. In the greater number of instances, in which I saw castration done at St. Bartholomew's Hospital, in the course of my apprenticeship there, the last method was selected; and though it is a degree better than the abdominal practice of surrounding the whole cord with a ligature, it cannot be said to be deserving of imitation; for the agony, created by the inclusion of all the spermatic nerves, is not only severe, but absolutely unnecessary in a proceeding, the sole aim of which should be the security of the patient from hemorrhage. A far better plan is to apply no ligature in any

\* "After the operation was completed, and the wound dressed, the patient being seized with a fit of coughing, to the astonishment and dismay of the surgeon, the dressings were forced off by the protrusion of several convolutions of small intestines."



way to the spermatic cord previously to its division; but to hold the part between the left thumb and forefinger, just above the point where it is to be cut through, which is to be done as near to the diseased testicle as the healthy state of the cord indicates. The surgeon may then either imitate Mr. Bromfield, and deliver that extremity of the spermatic cord, which is separated from the testicle, to an assistant, who is to press it between his finger and thumb to prevent any hemorrhage, until the diseased testicle is removed from the scrotum, and an opportunity is given to take up the spermatic arteries with the forceps or tenaculum, as separately as possible from the nerves;\* or the still better plan, adopted by Desault, may be pursued, which consisted in dividing the cord in the preceding manner, and then holding the upper end of it between the thumb and forefinger of his left hand, while, with the forceps or tenaculum in his right hand, he immediately proceeded to take up the mouths of the spermatic arteries, and afterwards continued the dissection of the diseased testis from the scrotum.† Besides the spermatic arteries, the artery of the vas deferens must be sought for, and if it bleed much, have a fine ligature put round it. Desault's method I conceive to be the best, because if the upper portion of the cord should happen to be short, the attempt to transfer it to the hand of the assistant would be attended with some risk of its slipping away, and retracting within the abdominal ring, before the arteries were secured. But, when the surgeon holds it steadily between the thumb and forefinger of his left hand, until he has taken up the mouths of the bleeding vessels, no chance of its premature retraction is incurred. The fear of such an accident has had a great deal of influence over the conduct of many surgeons in this part of the operation, and their alarm has been increased by Mr. C. Bell's having seen the thing happen twice in his practice, when both the patients were lost by hemorrhage. But, had the operator, in these unfortunate examples, been careful to take firm hold of the upper portion of the cord, before he ventured to divide it, the retraction could not have happened; and, when it did happen in consequence of this neglect, had he had discernment enough to know what ought then to have been done, neither of his patients would have fallen a victim to bleeding. In short, had he considered the course which the cord takes obliquely upward and downward, it would have been easy for him to have followed the bleeding part with perfect safety, even to the ori-

\* W. Bromfield, *Chirurgical Observations and Cases*, vol. ii. p. 336. 8vo. Lond. 1773.

† *Œuvres Chir. de Desault*, par Bichat, tom. ii. p. 451.

gin of the cremaster muscle, which pulls it up.\* It must be obvious, that the retraction of the upper portion of the cord within the ring must be more likely to happen, when the extension of the disease upwards obliges the surgeon to divide the part higher up, than will well allow the retraction to be securely prevented by 'the thumb and forefinger of the left hand. In cases of this description, it has been proposed to avert the accident, by separating the cord into two fasciculi, and with the aid of a needle, putting a double ligature betwixt them, before the part is cut through. The design of this ligature is to draw down the cord, while the surgeon is taking up the mouths of the vessel; or, if he cannot thus stop the hemorrhage, one portion of the double ligature is recommended to be tied over the front, and the other, over the posterior part, of the cord.† Another plan consists in raising the exposed cord by passing under it the left forefinger, and then, instead of cutting the part through at once, leaving the posterior third of it undivided. The first incision will divide the principal artery and its branches, which are to be taken up singly, while the weight of the testis hinders the part from retracting. Then the vas deferens is to be cut, and, if its artery be not large enough to require a ligature, the rest of the cord is to be divided.‡

Desault's mode of operating, when the disease of the spermatic cord reaches high up, appears to me, in every respect, worthy of imitation. He was perfectly aware, that in cases of sarcocele, the weight of the testicle draws the cord further out of the abdominal ring than is natural, and that when that process is enlarged and indurated a good way upward, the sound portion of it, situated at or near the ring, was originally placed far within that aperture. Hence, as soon as the weight of the testis is taken off, a considerable retraction of the cord instantly follows, and the end of the healthy portion of it slips immediately into the ring. When the spermatic cord was diseased high up, Desault varied his mode of operating, and, instead of dividing the cord, before he had separated the testis from its loose connexion with the scrotum, he first completed the dissection of the diseased mass, and secured whatever vessels required ligatures in the cavity of the scrotum. He then gently drew the spermatic cord a little further out of the ring, until he had enough to take secure hold of with his left thumb and forefinger, above the high point where the disease made it absolutely necessary to cut it through. Lastly, the operation was

\* See *Operative Surgery*, by C. Bell, vol. i. p. 229.

† C. Bell, vol. cit. p. 228.

‡ Ibid. p. 225.

finished by dividing the cord, and taking up its arteries with the tenaculum, or forceps; the surgeon holding the extremity of the cord himself with the left forefinger and thumb, while his right hand was employed in raising the mouths of the vessels, in order that an assistant might tie them with small ligatures.\*

That part of the operation which has for its object the taking of the diseased testicle out of the scrotum, whether it precede or follow the division of the spermatic cord, is extremely simple. It merely consists in dividing the loose cellular substance which connects the testicle with the inside of the scrotum; and in performing this easy task, it is proper to incline the edge of the knife towards the tumour, which, after the division of the cord, may be considered as dead, and destitute of sensation.

When the diseased testicle is much enlarged, it is reckoned advantageous to remove a part of the distended scrotum, because a considerable quantity of loose flabby skin makes it difficult to put the edges of incision evenly together, and is apt to serve as a lodgment for matter.† The manner of executing this object consists in including the portion of the scrotum that is to be taken away in two elliptical incisions, the length and interspace of which must be regulated by the magnitude of the swelling. Then the spermatic cord having been divided, and the arteries secured, the diseased organ is to be dissected out, the incisions being extended on each side from the elliptical cuts already made.

Also, when a part of the scrotum is ulcerated, thickened, or adherent to the testis, two simular, or elliptical incisions, are to be made, which meet together above and below, and include the diseased part of the skin, which is not to be separated from the swelling, but taken away with it.

When the sarcocoele is very large, it may lie so close to the sound testis and the penis, that, if attention be not paid to the circumstance, and the knife be too freely used, both these parts may be injured. Sometimes, the enlarged testis approaches very near the urethra, and, without care, this passage may actually be wounded in the detachment of the tumour from its surrounding connexions. When the swelling is of considerable size, it presses closely against the septum scroti, which is then very liable to be wounded, and the tunica vaginalis of the sound testicle opened; an accident, which may produce a good deal of inflammation, and therefore ought to be attentively avoided.‡ Former surgeons had great apprehen-

\* See *Œuvres Chir. de Desault*, t. ii. pp. 454, 455.

† See Sharp's *Treatise of the Operations*, p. 51, edit. 3; *Bertrandi, Traité des Opérations de Chirurgie*, p. 209. Paris, 1784.

‡ See *Richter's Anfangsgr. der Wundarzn. b. vi. p. 162.*

sion of wounding the septum scroti, and the common warning, vociferated in the operation, used to be, "take care of the septum scroti:" but the truth is, if it were not for the chance of laying open the opposite tunica vaginalis, and doing mischief to the sound testicle at the same time, a wound of that part, which is merely condensed cellular substance, would be of trivial importance.

There is no surer way of avoiding the foregoing inconveniences, than being particularly attentive, in the dissection of the diseased testis out of the scrotum, always to incline the edge of the scalpel towards the swelling; a method, which was invariably followed by Desault, because when the trunks of the spermatic nerves had been divided, together with the rest of the cord, the inclination of the knife towards the diseased testis appeared to him the least painful mode of proceeding.

As far as my own experience reaches, the most troublesome bleedings which happen after castration, proceed not from the spermatic arteries, but from the vessels within the scrotum. Hence, I cannot too urgently recommend the surgeon to tie every considerable artery of the scrotum as soon as it is cut,\* for, if this plan be not adopted, the vessels quickly retract amongst the loose cellular texture of the part,† and though they will bleed again largely soon after the closure of the wound, they stop for a time just when the separation of the testis is completed, and baffle the utmost endeavours of the surgeon to find them. In particular, the artery of the septum scroti, which is much larger than natural in cases of sarcocoele,‡ and often of greater size than the spermatic artery itself,§ will generally require a ligature. The ligatures here used should be made of fine dentist's silk, and cut short after their application, as the wound always suppurates more or less, and the small fragments of silk contained in it constantly come away with the discharge, without the slightest inconvenience.

The operation being finished, the last business is to dress the wound. In this country, it has been the practice, ever since the time of Mr. Pott, to endeavour to heal as much of the wound as possible by the first intention. With this view, the edges of the incision are brought together, either with strips of adhesive plaster alone, or with these, assisted by one or two sutures. A pledget is then to be applied over the wound, and the con-

\* Desault, *Œuvres Chir.* t. ii. p. 451. This eminent operator regularly adopted the method for another reason, which was, that it prevented all obscurity as to the parts which he afterwards cut, the wound being free from blood.

† *Dict. des Sciences Med.* t. iv. p. 274.

‡ Petit, *Traité des Mal. Chir.* t. ii. p. 524.

§ Flajani, *Collezione d'Osserv.* t. ii. p. 151.



tact of the parts further promoted, by laying suitable compresses over each side of the incision, and supporting the whole with a T bandage. It must be acknowledged, that union by the first intention is here attempted under very unfavourable circumstances, as it is difficult to maintain the parts in exact contact, and the scrotum, deprived of the enlarged testis, forms a cavity, in which it is hardly practicable to hinder suppuration. Some of the modern French surgeons are inclined, therefore, to deny the advantage of the above mode of dressing the wound, and in Paris, the old plan of filling the scrotum with charpie, and letting the parts suppurate and granulate, is still very commonly adopted.\* It is true, complete union by the first intention, is seldom or never accomplished, yet, by attempting it, the wound is much diminished, and the cure is rarely delayed later than three or four weeks; whereas the wound, when stuffed with lint, is usually not healed in less than seven or eight weeks.†

Sometimes, after the patient is put to bed, a hemorrhage takes place; and, frequently, when the wound is opened, no particular bleeding point can be discovered. I have generally found the application of cold water to the scrotum, by means of wet linen placed over the adhesive plaster, the best way of checking this kind of hemorrhage. Should this plan be unavailing, however, as is sometimes the case, the dressings must be taken off, and the bleeding vessel looked for, and tied. Such hemorrhage from the arteries of the scrotum, may proceed to a very hurtful, and even dangerous degree, without being suspected; for, the blood flows out of the lower angle of the wound, over the patient's thigh, into his bed, while the outward dressings are perfectly dry and unstained. During the first twenty-four hours after the operation, therefore, the part of the bed under the scrotum should be from time to time felt and examined, in order that no concealed hemorrhage may be allowed to continue.‡

When severe inflammation follows castration, venesection, leeches, and other antiphlogistic remedies are indicated; while much disorder of the nervous system, great pain in the wound, spasms, restlessness, &c. require the use of opium and emollient poultices. Tetanus, retention of urine, convulsions, incessant vomiting, tension, and swelling of the belly, peritonitis, abscesses in the course of the cord, delirium, and incurable fits of epilepsy, were more common after castration in former times,

\* Roux, *Parallèle de Chirurgie Angloise avec la Chirurgie François*, p. 120, &c. 8vo. Paris, 1815.

† J. Cross, *Sketches of the Medical Schools of Paris*, &c. p. 144.

‡ Richter's *Anfangsgr.* b. vi. p. 163.

when it was the custom to include the whole of the spermatic cord in the ligature. Possibly, in a few examples, the alleged evils might not depend immediately upon this mode of tying the cord, because the symptoms sometimes first came on after the separation of the ligature;\* and there is no reason why this operation should not on other accounts be sometimes followed by tetanus, and other bad consequences, just like the generality of other severe operations. But, as the fact is established, that all these dangers are less frequent, after the modern improved method of removing a diseased testis, than they were after the old plan of operating; while many cases on record also prove, that the above-mentioned bad symptoms have often been suddenly appeased by simply cutting and taking away the ligature;† we have the most unequivocal evidence, that such application of the ligature to the whole cord, has frequently been the immediate cause of all the patient's danger and suffering.

I have not ventured to load the present chapter with an account of every artifice suggested for stopping the bleeding from the spermatic arteries, without applying a tight ligature on the whole cord. My own observations have convinced me, in opposition to the sentiments expressed by Acrel‡ and Loder, that the vessels of the cord may be easily taken up with the forceps or tenaculum, and separately tied; and this opinion is also confirmed by the statements of what others have seen and done.§

After the operation, the upper part of the spermatic cord occasionally swells so considerably, that it becomes strangulated by the abdominal ring, and vast suffering is the consequence. Authors state, that this case may require a division of that aperture.|| However, the present manner of securing the vessels of the cord, supersedes all occasion for this practice; because tying them separately never produces so considerable a swelling of the cord, as used to be sometimes an effect of the inclusion of the whole of it in the ligature.¶

\* Morand; Mursinna; Loder, *Chir. Journ.* b. i.

† See Cases in the *Chirurgical Work* of B. Gooch, vol. ii. p. 240. 8vo. Lond. 1792; Petit, *Traité des Maladies Chir.* t. ii. p. 528, &c.

‡ Acrel, *Chirurg. Vorfälle*, b. i. s. 447; Loder, *Chirurgisch-Medicinische Beobachtungen*, p. 111. 8vo. Weimar, 1794.

§ See *Œuvres Chir. de Desault*, t. ii. pp. 451-455. C. Bell's *Operative Surgery*, vol. i. p. 229. "M. Roux (says another modern writer) took up all the arteries with a pair of dissecting forceps, and he did this exceedingly well, never once letting the instrument slip off them." See Cross's *Sketches of the Medical Schools of Paris*, p. 141; also, Sir Astley Cooper's *Lectures*, vol. ii. p. 161.

|| Bertrandi, *Traité des Opérations*, p. 209.

¶ Sabatier de la *Médecine Opératoire*, t. ii. p. 302.

## CHAPTER XLI.

## CIRSOCELE AND VARICOCELE.

THE latter term implies nothing more than a preternatural dilatation of the blood-vessels of the scrotum. These, like the vessels in other parts of the body, are liable to become varicose; but they are seldom so much enlarged as to be troublesome.

Cirsocele is a varicose enlargement of the spermatic veins, frequently producing great uneasiness, and sometimes a wasting of the testicle. It is commonly limited to that part of the cord, which is below the abdominal ring; and the vessels are generally larger, the nearer they are to the testicle. It is attended with a sense of weight in the scrotum; an unequal knotty swelling; and, if the disease affects the whole corpus pampiniforme, with a feel that seems to arise from a bundle of ropes or earthworms. The disease generally begins at the lower part of the spermatic cord by the side of the testis. Excepting the uneasy sensation of weight in the scrotum, and a little tenderness when pressed, a recent cirsocele is productive of little inconvenience. But, in an advanced stage of the disease, severe pains gradually come on, sometimes extending up to the back and loins, and down the thigh. The case does not invariably make the kind of progress above described: it is often confined to the spermatic cord, or epididymis; and it has been known to continue in this state for many years, without increasing, notwithstanding the patient's employments were of a nature very likely to aggravate the disease. Standing long at a time, walking, horse-exercise, great exertions of the lungs, and every thing requiring forcible expirations, always augment the turgidity of the veins, and the painful sensations experienced by the patient. The weight of the testis, when this organ is not wasted, appears also to have a similar effect.\*

This disease is more frequently than any other disease mistaken for an omental rupture. A friend of mine, who was in the army in Bengal, put himself to the expense of returning to England, in consequence of his having been told by the surgeons in India that he had a rupture, while his complaint was only a cirsocele, unaccompanied with any severe symptoms. When nothing is done for the relief of this complaint, it gradu-

\* Delpach, *Précis Elémentaire des Mal. Chir.* t. iii. p. 266.

ally enlarges, and extends upwards towards the abdominal ring. At length, the thickening and dilatation of the whole venous and cellular texture of the cord attains such a degree, that the ring itself seems dilated. In this state, the disease is particularly apt to resemble an omental hernia. As the tumour now extends into the ring, while this is also enlarged, there may be an appearance, as if the parts actually protruded from that opening; and, since, in this advanced stage of the disease, the veins always contribute very much to the swelling, this, like an omental rupture, undergoes a considerable increase, when the patient remains a good while in the standing posture, coughs, or holds his breath, and it subsides, when he lies down for any length of time. Sometimes, like a hernia, the swelling even admits of being partly pressed up into the abdomen.

A little attention, however, will enable the surgeon easily to distinguish the two diseases. In the first place, an inquiry into the history of the case from its commencement will elucidate the question; from such an inquiry, it will be learnt, that the swelling first appeared at the lower part of the scrotum, and had no connexion with the abdominal ring. The peculiar sensation felt by the patient, when the tumour is pressed upon, and, in some cases, the wasted state of the testis, are other circumstances, which will leave scarcely a doubt of the disease being a cirsocele. Lastly, it may be remarked, that the increase and diminution of the swelling happen quite differently from what they do in an omental rupture. Cirsocele, under the circumstances above specified, not only enlarges or diminishes very slowly, but whilst it is increasing, or subsiding, nothing can be felt descending or ascending through the abdominal ring, by the surgeon's finger, while kept upon that opening. When two of the fingers are firmly applied to the same aperture, the swelling enlarges from the accumulation of blood in the veins; but nothing is felt falling down, as would be the case, if the disease were a hernia. In addition to these marks of discrimination, it is to be recollected, that various symptoms of an omental rupture are here absent.\* The direction which Sir Astley Cooper gives for avoiding mistakes, is simple and good; the patient is to be placed in a horizontal posture, and the swelling emptied by pressure; the surgeon is then to put his fingers firmly upon the abdominal ring: if the case be a hernia, the tumour cannot re-appear, as long as the pressure is continued at the ring; but, if the disease be a cirsocele, the swelling will appear again with increased size, on account of the return of blood into the abdomen being prevented by such pressure.†

\* Richter, Anfangsgr. b. vi. p. 168.

† See A. Cooper's Anatomy and Surgical Treatment of Inguinal and Congenital Hernia, fol. Lond. 1804.



A cirsocele may be really combined with a hernia; a case which is extremely perplexing, because the former complaint renders the patient incapable of wearing a truss.

The generality of surgical writers impute the origin of this disease to circumstances, which they think calculated to produce either a relaxation of the seminal vessels, a greater determination of blood to the parts of generation, or an impediment to the easy return of the same fluid from the testis through the spermatic veins. Hence, excessive indulgence in venery; a severe bruise of the groin;\* any thing retarding the flow of blood through the lower vena cava; a sedentary life; and the pressure of an ill-made truss upon the spermatic cord, are particularly specified as conducive to the disease. It has also been asserted, that the complaint most frequently affects the left testicle; a circumstance, which is attempted to be explained by the pressure made by the sigmoid flexure of the colon upon the spermatic vessels in its distended state.† It is not clear, that any thing very certain is known, concerning the periods of life most liable to the complaint. One good author informs us, that young persons are more liable to it than adults;‡ while another, of equal repute, assures us, that it is commonly met with in adults and old subjects, and but rarely in young persons.§ I have seen the disease in patients both young and old, though never in children: the case mistaken for omental hernia, and on that account sent home from India, took place in an officer not more than eighteen years of age.

An entire cure can seldom be effected. When the disorder occasions pain, cold astringent lotions should be applied over the testicle and cord; blood should be repeatedly taken away by means of leeches; the bowels kept gently open; the patient placed in a horizontal posture; and the testicle supported with a bag-truss.

In ordinary cases, supporting the testicle with this kind of suspensory bandage, is the only thing, to which the patient finds it necessary to attend.

One can hardly suppose a case so severe, and incapable of palliation, as to require the performance of castration, though such instances are mentioned by very good authors. Thus we have upon record an example, in which a cirsocele followed a violent blow upon the groin. The immediate consequences of the injury were appeased by antiphlogistic remedies; but, after two or three months, the pain in the spermatic cord, which had

\* See Case recorded by Gooch, in his *Chir. Works*, vol. ii. p. 244.

† Petit, *Traité des Maladies Chir.* t. ii. p. 501. 8vo. Paris, 1774.

‡ Lassus, *Pathologie Chir.* t. i. p. 346. 8vo. Paris, 1809.

§ Delpéch, *Précis Élémentaire des Maladies réputées Chirurgicales*, t. iii. p. 266. 8vo. Paris, 1816.

never been entirely suppressed, became considerably more violent; affecting also the loins and testicle; the testicle itself being diminished, and the epididymis enlarged. Notwithstanding every means, external and internal, the sufferings increased, and became so insupportable, that the patient could get no rest, without the constant use of opiates. Hence, castration was done, and a speedy cure ensued.\*

## CHAPTER XLII.

### HERNIA HUMORALIS, OR INFLAMED TESTICLE.

#### SYMPTOMS.

THE first symptom is generally a soft, pulpy fulness of the body of the testicle, which is exceedingly tender. The fulness increases to a hard swelling, accompanied with considerable pain. The hardest part is commonly the epididymis, and principally the lower portion of it, as may be distinctly felt. The spermatic cord is often affected, and particularly the vas deferens, which is thickened, and, when touched, very tender and painful. The spermatic veins sometimes become varicose; colic pains may be experienced in the bowels; and sickness is a common symptom, and even vomiting. In some cases, a great accumulation of air takes place in the alimentary canal, producing much oppression and inconvenience.† The bowels in other instances are obstinately constipated, and if this symptom be conjoined with incessant vomiting, a large tumour of the scrotum, and great swelling and thickening of the spermatic cord, the case may partly resemble a hernia, from which, however, a surgeon, well acquainted with all the characters of the latter disease, will have no difficulty in distinguishing it. A severe pain in the loins is usually attendant on the complaint. In addition to the preceding complaints, the patient, in severe cases, has a great deal of symptomatic fever, pain shooting down the thighs, and considerable heat and difficulty in making water. The scrotum, in consequence of the distention which it suffers, becomes smooth, loses its corrugated appearance, and is

\* See the *Chirurgical Works of B. Gooch*, vol. ii. p. 244. 8vo. Lond. 1792.

† See a *Treatise on the Venereal Disease*, by John Hunter, p. 54, 2d edition. 4to. Lond. 1788.

redder than in the healthy state. The disease rarely affects both testes at once; though, as Mr. Hunter observes, it sometimes happens, that the swelling changes from one of these organs to the other with surprising rapidity.\* In slight cases, the vas deferens and epididymis may be affected alone;† but, in all usual examples, the body of the testis is equally implicated. Any man, says Mr. Hunter, who is accustomed to know the difference between a swelling of the whole testis, and that of the epididymis only, will immediately be sensible, that in hernia humoralis the whole testis is commonly swelled. This organ assumes the same shape that it does from other causes, where we know, from being obliged to remove it, that the whole has swelled, and the pain is in every part of it. Mr. Hunter has seen hernia humoralis suppurate at the anterior part of the swelling; he has known several instances, in which the complaint produced adhesions between the tunica albuginea and tunica vaginalis, as was discovered after death, or in the operation for a partial hydrocele. Such changes, says he, could not have taken place, if the body itself of the testis had not been inflamed.‡

A bruise may occasion a hernia humoralis: we see it purposely caused by the surgeon, when he undertakes the radical cure of a hydrocele. But, of all the various causes of this complaint, by far the most frequent is irritation in the urethra. Hence, it more frequently arises in consequence of a gonorrhœa, than any other cause; and persons with bad strictures, for which they are using bougies, are also particularly exposed to its attack. It is commonly thought, that, in cases of gonorrhœa, a swelled testicle occurs with particular frequency, when the patient takes too much exercise, employs stimulating injections, drastic purgatives, or indulges in coition and spirituous drinks. It is also believed, that the complaint is less likely to happen, when the scrotum is well supported with a bag-truss, during the continuance of the discharge from the urethra. It is very remarkable, that, in cases of gonorrhœa, the pain in making water, and the quantity of purulent discharge from the urethra, are almost always very suddenly diminished, as soon as the testicle begins to enlarge; the discharge, indeed, being frequently quite stopped. This curious circumstance has attracted a great deal of attention, and has been repeatedly adduced, by theorists, as a proof of the *metastasis* of a disease, or of a sympathy between the testicle and urethra. The latter sentiment was espoused by Mr. Hunter and Girtanner, and is what is at

\* On the Venereal Disease, p. 54.

† Richter, Anfangsgr. b. vi. p. 171.

‡ Hunter, on the Venereal Disease, p. 55.

present entertained by the generality of modern surgeons: the arguments in its support are indeed both numerous and weighty. Inflammation of the testicle is sometimes manifestly excited by simple local irritation in the urethra, as by the introduction of a bougie. Certain inflammatory swellings of the inguinal glands are commonly acknowledged to be nothing more, than sympathetic effects of local irritation in that canal. Most of the authors who believed in the doctrine of hernia humoralis being a consequence of the translation of the matter of gonorrhœa from the urethra to the testicle, believed also that such matter was impregnated with the syphilitic virus. Yet, their credulity ought to have been shaken, when daily experience revealed to them, that the inflammation and swelling of the testicle ultimately subsided, without ever being followed by any other secondary symptom, which would often have ensued, even according to what we now know of syphilis, had the complaint truly arisen from the venereal poison really attacking the part. These ready believers ought at least to have hesitated in making the inference which they did, when it was well known to them, that a hernia humoralis never originated from a syphilitic chancre, although, in this particular case, other parts, at a greater or lesser distance from the sore, did really have the effects of the virus thrown upon them by the action of the absorbents.

Perhaps, at the present day, the curability of the disease without mercury, would not be allowed to have much weight in deciding whether the case were syphilitic, or not; but, it is surprising, that it had not more influence in less enlightened periods, when it was not uncommonly supposed, that no form of the true venereal disease could be eradicated, without the aid of its great reputed specific, mercury. That the swelling of the testis could not arise from syphilis,\* might have been inferred from the consideration, that the tumour often came on quite suddenly, and as suddenly disappeared, or shifted to the other testicle; and that it often subsided with wonderful rapidity, on the removal of the irritation in the urethra, or the exhibition of an emetic. It might also have been seen, that in certain instances, the clap did not stop until the testis had been affected some days; nor would anatomy have warranted any supposition of the existence of a set of absorbent vessels, whose course qualified them for conveying the matter of gonorrhœa directly from the urethra to the testicle.†

Although it would appear, that a hernia humoralis, in cases of gonorrhœa, is frequently a sympathetic effect of irritation in

\* Mr. Hunter assures us, that, as far as his experience goes, the testis is never affected with the venereal disease, either local, or constitutional. See *Treatise on Venereal Disease*, p. 56.

† Richter, *Anfangsgr. b. vi. p. 172.*



the urethra upon the testis, there is some reason for suspecting that this is not invariably the case. Thus, as Mr. Hunter remarks, as singular a circumstance as any, respecting the swelling of the testicle, is, that it does not always come on when the inflammation in the urethra is at its height. He thought, indeed, that it oftener happened, when the irritation in the urethra was going off; and, sometimes, even after it had entirely ceased, and when the patient conceived himself to be quite well.\* Sometimes the swelling of the testis occurs, without any stoppage of the running. In certain examples, the patient has no painful sensations in the urethra; and the affection of the testis has been known to commence as late as a fortnight after the gonorrhœa and all its usual symptoms had entirely ceased.†

Another mode of accounting for this not unfrequent inflammation of the testis in cases of gonorrhœa, is, by supposing the irritation to be propagated from the mouth of the vas deferens, successively to the spermatic cord, epididymis, and the body of that gland. But, the truth of this conjecture is doubted by Hunter, on the ground, that a hernia humoralis is as frequent in cases where the inflammation extends only a little way along the urethra, as in other cases, where it reaches further, and the mouths of the vasa deferentia must be more or less inflamed. He thought also, that, if this explanation were correct, both testes ought to be more commonly affected together.‡

Leaving these abstruse points to the consideration of such readers as may feel inclined to theorize further upon the subject, I shall rest contented with merely knowing and mentioning the fact, that, in cases of gonorrhœa, the occurrence of hernia humoralis is usually attended with a sudden, and consider-

\* Treatise on the Venereal Disease, p. 56, edit. 2.

† Swediaur.

‡ {Mr. Abernethy says, "I have no doubt but the swelled testicle, or hernia humoralis as it is called, is produced by irritation occurring at the prostatic part of the urethra, where the seminal ducts terminate, and that it is propagated through one or other of these ducts to the testis." "I have observed that the testicle generally remains irritable, and liable to these renewals of the disease, for about three weeks after the first attack; and I am therefore inclined to believe, that the irritation in the prostatic portion of the urethra usually subsides about this period. I have known many persons, who, having suffered most severely from swelled testicle on former occasions, submitted to confinement for about three weeks after they perceived the testicle was affected, and thus escaped with only a trifling enlargement of the gland. Inflammatory symptoms and fever did not gain any degree of intensity, and the pain never increased so as to be troublesome. This circumstance leads me to conclude, that the disease consists in an irritable state of the affected parts, and that the degree of inflammation is the consequence of impropriety of conduct, or of neglect of those measures of precaution by which it might be rendered of trifling importance."}

able diminution, and even a total cessation, of the strangury, and discharge from the urethra. This amendment, in the latter complaint, generally continues till the vehemence of the hernia humoralis has abated, and then the pain in making water, and the copious discharge, frequently recur.

Inflammation of the testicle, however, is a complaint remarkable for its irregularities. In a few cases, the swelling of the testicle, instead of being followed by any diminution of the discharge from the urethra, as is most common, is immediately succeeded by a return of the running with increased violence, which remains as long as the hernia humoralis itself.\*

#### TREATMENT OF HERNIA HUMORALIS.

The patient should be kept perfectly quiet, and in a horizontal posture in bed. If he be young and robust, the swelling of the part considerable, and the pain in the loins violent, phlebotomy may be practised; the quantity of blood taken away, and the repetition of the operation being determined by the patient's ability to bear the evacuation, and by the state of the local disease. In very severe cases, where yet the stomach was quiet, I have frequently prescribed nauseating doses of tartarized antimony, with decided advantage. In almost every case, bleeding with leeches is to be repeatedly put in practice, and saline purgative medicines administered. With regard to local applications, as far as my own observations extend, fomentations and poultices prove more beneficial than cold astringent lotions. But, an object of the highest importance, is to keep the testicle constantly supported, by means of a bag-truss, or suspensory bandage, which often relieves the violent pains in the back and thigh immediately it is put on.

Mr. Hunter states that emetics have been known to remove the swelling almost instantaneously. Without giving full credit to the literal meaning of this observation, it is very certain, that the great degree of swelling, in cases of hernia humoralis, often occurs and subsides more rapidly, than that of any other inflammatory affection whatever.

When the pain in the part and loins is unusually severe, opiates become necessary.†

After the inflammation is completely subdued, the hardness of the epididymis commonly remains. Sometimes it may be lessened by frictions with camphorated mercurial ointment, or the use of discutient plasters; but, in general, more or less of it continues during life. Mr. Hunter suspected, that, in some testicles, which remain indurated at the epididymis, the latter canal is impervious, and the organ of course totally useless.

\* J. Hunter, op. cit. p. 55.

† See NOTE G.

This kind of hardness is in other respects not at all disposed to give trouble, or degenerate into a malignant disease, or extensive sarcocele, affecting the whole of the testis. At least, experience proves, that such consequences are very rare.

Inflammation of the testicle sometimes, but not often, terminates in suppuration; and the matter may be situated either in the cellular membrane of the scrotum, within the tunica vaginalis, or in the substance of the testis. When the abscess is evident, there should be no delay in opening it. Small suppurations of the testis are alleged not to unfit the part for its function in the animal economy.\* When the pulpy substance of this organ is affected, the tubuli testis of which it is composed are said to be liable to be discharged with the matter, in the form of gray stringy particles; and the more of it the surgeon draws away, the smaller the testis becomes, so that at length, if this plan be followed up, the tunica albuginea is left by itself quite empty, with the remaining epididymis.†

## CHAPTER XLIII.

### OF CANCER SCROTI; CHIMNEY-SWEEPERS' CANCER; OR SOOT-WART.

THE chimney-sweepers' cancer was first described by the celebrated Mr. Pott. It is said to be endemial in this country; a circumstance, that is ascribed to the particular kind of soot which arises from the vast quantities of sea-coal here consumed as fuel. At all events, the disease has never been noticed in France;‡ and Ramazini, who published on the disorders to which workmen are particularly exposed, makes no mention of the cancer scroti.

This disease almost always makes its first appearance in the inferior part of the scrotum, where, as Mr. Pott observes, it produces a superficial, painful, ragged, ill-looking sore, with hard and rising edges. With the exception of one case, which was shown to him by Sir J. Earle, and which occurred in a child

\* Richter, *Anfangsgr. b. vi. p. 178.*

† See Petit, *Traité des Maladies Chir. t. ii. p. 513, &c. 8vo. Paris, 1774.* Also, *Mém. de l'Acad. de Chir. t. iv.*; and Morand, *Opuscules de Chir. 4to. Paris, 1768.*

‡ Richerand, *Nosographie Chirurgicale, tom. iv. p. 290, edit. 2.*

under eight years of age,\* that eminent surgeon never saw the complaint occur under the age of puberty. According to Mr. Earle, as the disease advances, the parts immediately contiguous to it become affected; it spreads downwards to the perinæum, and, if not arrested, will include the whole scrotum, and not unfrequently one or both testicles. When the testicle is first affected, it becomes firmly connected with the diseased scrotum, enlarged, and considerably indurated. Ulceration, and sometimes sloughing, then take place, leaving a deep excavated ulcer, that penetrates into the body of the testis, which does not appear disposed to throw out a fungous growth. Another very important remark, made by Mr. Earle, is, that when the inguinal glands are enlarged, they will generally subside after the removal of the diseased scrotum.† Lastly, the disease extends up the spermatic cord, to parts within the abdominal ring, and then is very soon painfully destructive.

It is supposed, that this terrible malady commonly derives its origin from the lodgment of soot in the rugæ of the scrotum. Hence, at first, it must be entirely of a local nature.

It is proper to observe, that though this peculiar disease hardly ever occurs, except on the scrotum, two rare examples have been recorded by Sir J. Earle, in which the distemper happened in other situations. In one instance, it attacked the face; in another, it took place on the back of the hand.‡

Mr. Pott believed that the disease was confined to chimney-sweepers; but Sir J. Earle met with it in other descriptions of persons, in whom, however, the origin of the complaint was traced to the action of soot.

If there be any chance of putting a stop to the above mischief, it must be the immediate removal of that part of the scrotum where the sore is; for, if it be suffered to remain until the testicle becomes affected, the performance even of castration will generally be too late. Mr. Pott informs us, that he had often made the experiment, and that though the wound made by such operation sometimes healed favourably, yet, in the space of a few months, the patients generally returned either with the same disease in the other testicle, or in the glands of the groin, or with such a diseased state of the viscera, as soon ended in a painful death.

The cases, which Mr. Earle has seen, led him to adopt the opinion, that where the inguinal glands are affected, the operation ought still to be performed; and, as he has seen two lasting recoveries follow the removal of the diseased parts, even

\* See Pott's *Chirurg. Works*, by Earle, vol. iii. note, p. 178, edit. 1808.

† *Med. Chir. Trans.* vol. 12, p. 297.

‡ *Lib. cit.* pp. 178-182.



where the testis was involved, he approves of the attempt, provided the spermatic cord be sound.\*

I have seen several cases of this disease in St. Bartholomew's Hospital, but never knew one instance which was materially benefited by any medicines, or topical applications: I am, therefore, strongly impressed with the propriety of an early removal of the affected part of the scrotum. The loss of a portion of this part can never be attended with future inconvenience; and, as Mr. Pott most justly observes, it is a very good and easy composition for the preservation of life.

The operation, when done under the most favourable circumstances, will not always succeed: a patient, whose testicle was still unaffected, and his general health apparently unimpaired, died a month after the removal of the diseased part, with violent pains and great tension of the abdomen.†

When the disease has made too much progress to admit of extirpation, only palliative treatment can be pursued, and such medicines and applications as are recommended in the chapter on cancer may be employed.

## CHAPTER XLIV.

### GONORRHŒA, OR CLAP.

WHEN an irritating matter of any kind is applied to a secreting surface, the natural secretion becomes increased in quantity, and altered in quality; and when the ordinary mucous secretion of the urethra in men, or of the meatus urinarius, nymphæ, &c., in women, is, in this manner, changed into a fluid, resembling pus, the disease is named a *gonorrhœa*, or *clap*.

The complaint has been supposed to arise from the application of venereal matter to the urethra. A preternatural discharge from this passage, however, may result from any kind of irritation affecting it; and no doubt can be entertained, concerning the frequent origin of claps from the mere contact of various kinds of acrid and infectious discharges with the urethra, labia, nymphæ, &c., in coition. Altered secretions of these kinds may be formed from the mucous surfaces of the parts of generation in either sex, totally unconnected with the

\* Vol. cit. p. 301.

† Richter's Chir. Bibl. b. v. p. 130. This case was one which Dr. Michaelis had an opportunity of seeing when he was in England.

poison of syphilis. Strictures, and the employment of bougies, are both very frequent causes of what may be termed a gonorrhœa. Indeed, that various discharges from the urethra, attended with pain, and a sense of scalding in making water, were common, prior to the period not unfrequently assigned for the introduction of the venereal disease into Europe, is a fact of which irrefragable confirmations exist. Whether a species of gonorrhœa exists, which is truly syphilitic, is yet a contested point.

When the complaint follows some kind of contamination, received in coition, it usually begins about six, eight, ten, or twelve days afterwards; but it is capable of affecting some persons much sooner, and others much later. The first symptom is usually an itching at the orifice of the urethra, sometimes extending over the whole glans penis. A little fulness of the lips of the urethra is next observable. Very soon after the discharge has appeared, the itching changes into pain, especially at the time of voiding the urine. The penis, and particularly the glans, are affected with swelling. The latter part has a transparent appearance around the mouth of the urethra, the skin seeming distended, smooth, and red, like a ripe cherry. Sometimes the glans, as well as the beginning of the urethra, is more or less excoriated. This canal becomes narrower, as is proved by the stream of urine being smaller than common; a circumstance, which the believers in the muscular power of the urethra would ascribe to two causes, viz. the swollen state of the lining of the canal, and its spasmodic contraction; while others, who deny the existence of any muscular power in the membrane of the urethra, would account for the diminished diameter of the canal altogether by the effects of the swelling and thickening of its lining, the distention of the corpus spongiosum, and perhaps the action of the muscles about the perinæum. Small swellings are often observable along the lower surface of the penis, in the course of the urethra, and were suspected by Mr. Hunter to be enlarged glands. In some instances, Cowper's glands in the perinæum inflame and suppurate.

The natural discharge from the urethra is first changed from a transparent viscid secretion, to a watery, whitish, pellucid fluid; and this, becoming gradually thicker, assumes the appearance of pus. The matter often changes its colour and consistence; sometimes, it is almost white; sometimes, quite yellow; and, in other instances, greenish.

In ordinary cases, the affection of the urethra does not extend far along this canal from its orifice; perhaps not farther than an inch and a half, or two inches: this was, what Mr. Hunter named, the *specific extent* of the inflammation.

Besides the symptoms already mentioned, a very acute, scalding pain, is experienced in making water, which frequently can only be discharged by drops, or in an extremely small, broken stream. The bladder being also very irritable, the patient is incessantly troubled with a feel as if he wanted to make water, and is obliged to be repeatedly emptying that organ of what little collects in it.

In the neighbouring parts, a variety of other affections are occasionally produced: as pain, soreness, and uneasiness, all over the pelvis; and the scrotum, testicles, perinæum, anus, and hips, may become disagreeably sensible. The testicles often require to be suspended in a bag-truss, and are so irritable, that the least exertion makes them swell. The inguinal glands may inflame and enlarge, producing the kind of swelling termed a *sympathetic bubo*. In many instances, the patient is obliged, almost every five minutes, to make water with violent pain, not only in the bladder itself, but in the glans penis; the pain frequently continuing after the urine has been discharged.

#### OF THE POWER OF THE MATTER OF GONORRHŒA TO COMMUNICATE THE VENEREAL DISEASE.

That many ordinary discharges from the urethra in men, and from the surfaces of the labia, nymphæ, meatus urinarius, &c., in women, have no connexion with syphilis, is a truth, which I take to be at present generally admitted. But, whether there may not be a particular species of gonorrhœa, which arises as an effect of the application of syphilitic matter to the secreting surfaces above specified, and which is even capable of producing secondary syphilitic effects in consequence of absorption, is a question that is by no means universally and finally settled. The arguments, which have been broached in support of this doctrine, are, first, the probability, that the Otaheiteans had the venereal disease propagated to them by European sailors, who were affected with gonorrhœa; for, these could hardly be supposed to have a chancre during a voyage of five months, without the penis being destroyed. Secondly, Mr. Hunter mentions a gentleman, who had a gonorrhœa thrice, of which he was cured without mercury. About two months after each infection, he had symptoms of lues venerea. The first were ulcers in the throat; the second were blotches on the skin: both which forms of the disease yielded to mercury. Thirdly, two punctures were made on the penis, with a lancet dipped in the matter of a gonorrhœa. One of these produced, on the part of the prepuce, where it was made, a red, thickened speck, which increased and discharged purulent matter. This supposed chancre healed, on having its surface repeatedly destroyed with caustic. The other puncture was made on the glans, where it was followed

by a pimple, full of yellowish matter. This pimple was touched with caustic, and healed in the same way as the sore on the prepuce. Four months afterwards, the chancre on the prepuce broke out again; then it healed, but once more returned. This course it followed several times; but always healed without any application to it.\* While the sore remained on the prepuce and glans, a bubo formed in the groin. A sufficient quantity of mercury was given to cure the gland locally; but not to prevent the constitution from being affected. Two months after the cure of the bubo, a venereal ulcer, according to Mr. Hunter, formed on one of the tonsils. This was cured by mercury; but the medicine was purposely left off as soon as the sore was skinned over, in order to see what parts would next be affected.

About three months afterwards, copper-coloured blotches made their appearance in the skin, and the ulcer on the tonsil recurred. This disease was again only palliated by mercury; but the complaints returned in their former situation; and were ultimately cured by a proper quantity of mercury.

On the other hand, doubts must exist, concerning this account of the effects of the matter of gonorrhœa, when the following circumstances are taken into consideration:

1st. It is impossible to say, what time may elapse between the application of venereal poison to the penis, and the commencement of ulceration. Therefore, Bougainville's sailors, alluded to by Mr. Hunter, might have contracted the infection at Rio de la Plata; but, actual ulcers on the penis might not have formed till about five months afterwards, when the ship arrived at Otaheite. At the same time, it must be sufficiently obvious, that every pretended elucidation of the mode, in which the venereal disease was communicated to the natives of Otaheite by European visitors, has its importance seriously lessened by the reflection, that the assumed fact of this disease having been first imparted to the Otaheiteans by European sailors, is quite as doubtful and unproved, as the common doctrine concerning the first origin of syphilis in Europe at the famous siege of Naples; or the opinion, that the distemper was brought from the new to the old Continent by the followers of Columbus. Who can presume to infer, that the island of Otaheite had never been visited by diseases of the parts of generation, before the arrival of the French navigators under Bougainville? In order to justify such a belief, the clearest evidence would be absolutely requisite, and this from men, whose visit to Otaheite was

\* These ulcerations, inferred by Mr. Hunter to have been venereal, and yet described by him as having healed without any thing being done to them, prove very unequivocally, that this great man knew perfectly well, that true chancres might be healed, not only without mercury, but without the use of any particular local applications.



early enough for the purpose, and whose professional acquirements made their testimony of value. On a point of this nature, nothing like traditional accounts should be allowed to have undue weight. If the Otaheiteans were never subject to ulcers on the parts of generation, discharges, eruptions, &c., before their intercourse with Europeans, they could have had nothing of human nature, or of the human constitution about them; for it is universally admitted with respect to all other nations, about whose former state we know any thing, that they were unquestionably subject to diseases of the parts of generation; and the firmest believers in the fabulous descriptions of the first origin of syphilis in Europe, would never deny that such distempers prevailed long before syphilis is imagined by them to have had its existence. Now, if we are warranted in concluding from analogy, that the Otaheiteans had some diseases of the parts of generation, before they had any intercourse with Europeans, it is an undertaking far beyond my compass to investigate what the exact nature of those complaints might be. As for the fanciful origin of the venereal disease in the new world, and its importation into the old, which account, if it were true, might perhaps be construed into strong evidence against Bougainville's crew, inasmuch as there would then be some definite ground for supposing, that it must have got into Otaheite by importation, just as it did into Europe, it is a doctrine liable to many weighty objections. Supposing we were to begin with admitting, either that syphilis was first brought into Europe from America, or that it originally broke out in the French army at the siege of Naples, in 1494, and that it afterwards gradually spread from the parts of Europe primarily infected to the many other countries which have since suffered from it, I do not see, that we advance a single step in the investigation of the causes of the first origin of the venereal disease. Whether the distemper were of American or Neapolitan birth, whence was derived the earliest stock of syphilitic poison? Are we to suppose, that the virus never had but a single source, and that the disease first *spontaneously* broke out only in one unfortunate male or female individual, by whose stock of infection, all the various nations of the world, and all future generations, were to be contaminated? Can the present received doctrines of syphilis be reconciled to this theory of its beginning spontaneously, without any exposure to the specific virus? The venereal disease, unlike many contagions, is not communicable through invisible effluvia in the atmosphere; and cannot extend itself, except by the positive application of the matter of the disease to some part of the body, where the poison first produces specific local effects, frequently followed by other consequences, in situations at a greater or lesser distance from the point first affected, which consequences are the result of the ab-

sorption of the virus into the constitution. The venereal disease then could never be imparted from contagion in the atmosphere; and, however contrary it may be to modern theories to imagine, that syphilis could arise as it were spontaneously, without the previous contact of the virus, reason must infallibly come to such a belief with respect to the early supposed instance of the disease. This fact is itself extremely curious, and involves many interesting reflections, which would carry me beyond my limits. I shall therefore merely add, that, if the disease did originally begin spontaneously, and an ulcer form of itself, capable of secreting syphilitic matter, the same thing may have happened in innumerable other examples, and the complaint, instead of having begun only in America, or in Italy, may have had myriads of self-created sources, and existed in every populous country from time immemorial. On the same principle, an attempt might also be made to account for the varieties of the complaint, and the production of different kinds of infectious matter. Such are the considerations which forbid me from attaching any importance to the opinion, that gonorrhœa is capable of communicating syphilis, and that it was actually the form of disease, in which the Otaheiteans had syphilis first communicated to them by European navigators.

2dly. The second argument adduced by Mr. Hunter, is certainly inconclusive. Every ulcer in the throat is not regularly venereal. A common ulcer may heal while the patient is using mercury. Hence, the cure, apparently accomplished by this medicine, is no proof that the complaint was syphilitic. 3dly. The last fact of inoculation appears strong, and more imposing. But, though the insertion of gonorrhœal matter, or any other morbid matter, beneath the cuticle, will undoubtedly produce troublesome local complaints, may we not doubt, that the sores, in the above case, were actually venereal? Can we implicitly depend upon the continence of the subject of the above remarkable experiments, during the long space of four months, between the healing of the sore on the prepuce, and its recurrence? If we cannot, the inference, with regard to the power of gonorrhœal matter to communicate the venereal disease, remains unestablished. The experiments might have been less objectionable, in respect to the possibility of a new chancre from a different source, if the inoculation had been practised on another part, instead of the penis. But, really, at the present day, the very circumstance of a sore repeatedly healing up and breaking out again, without the exhibition of mercury, or the use of any particular local applications, would be received by the most intelligent surgeons as a decided proof of the case not being actually syphilitic. With regard also to the secondary symptoms, the sore-throat and eruptions, it would require a more minute account of their appearance, especially

of the blotches, to be able to pronounce, whether they had the characters generally now supposed to appertain to the cutaneous effects of syphilis. We know not whether the eruption, for instance, was scaly or not; and, as for the sore-throat, even the deep excavated ulcer of the tonsils, is not now universally admitted as a criterion of syphilis. The fact of the sore in the throat having broken out again, after the patient had taken mercury enough to heal it, and keep it healed for three months, appears to me an argument against its being venereal on the Hunterian principles themselves. Let it be remembered also, that Mr. Hunter's experiments with gonorrhœal matter, have been repeated by others, and, if we are to credit the statements delivered by Mr. B. Bell on the subject, the endeavour to excite syphilis in this manner, completely failed. Yet, possibly, the matter discharged from the patient's urethra in Mr. Hunter's cases, might be of a specific nature, and different in its quality from what was employed by other experimenters. In short, the different result of all these experiments naturally leads back to the question, whether there may not be, as Hunter and many others suppose, a gonorrhœa of a specific syphilitic nature, distinct from common simple discharges from the urethra. However, if the matter of gonorrhœa be capable of communicating the venereal disease, why does not the discharge commonly produce chancres on the glans and prepuce, with which parts it must lie in contact a very considerable time in every case? Why also does not the presence of a chancre frequently cause a gonorrhœa? If the infection of one species of gonorrhœa and syphilis, be really of the same identical nature, certainly it is extraordinary, and contrary to what would be expected in the nature of things, that the former complaint should receive no benefit from mercury, while the various forms of the latter disease are acknowledged by all parties, whether they regard this mineral as the grand specific and only remedy for the distemper, or not, to be generally cured by it in less time, and with a smaller chance of relapse, than by any other known means. I shall say nothing in the present place, concerning the sentiment promulgated by Mr. Carmichael, that claps may produce a certain train of secondary symptoms, which he distinguishes by the term of the *papular venereal disease*; it being quite enough here to mark, that, whether this gentleman's views be altogether correct or not, he is to be classed with those writers, who do not consider the poisons of syphilis and gonorrhœa as being of the same identical nature, or capable of giving rise to similar secondary effects.\*

\* See Obs. on the Symptoms and Specific Distinctions of Venereal Disease, 8vo. Lond. 1818. Also, Essay on Venereal Diseases, 8vo. Lond. 1825. 2d ed.



## TREATMENT.

Gonorrhœa is one of those peculiar diseases, which have no specific remedy; but which, at the same time, have a propensity to get spontaneously well, and gradually wear themselves out. The complaint, in all its forms, is at first evidently of an inflammatory nature; and though we cannot at once effect a cure, we may palliate the symptoms, and shorten their duration, by the early adoption of certain antiphlogistic means.

Linen, wet with a cold evaporating lotion, should be kept constantly applied to the penis. The patient should keep his bowels well open with saline purges; live more abstemiously than common, avoiding spirituous drinks, and all spicy food; and render the quality of his urine as little irritating as possible, by taking in the course of the day, copious draughts of barley-water, mucilage of gum arabic, &c.

After a few days, some attempt may be made to alter the action of the vessels of the lining of the urethra, so that they may gradually be brought to secrete again the healthy mucous fluid, with which the canal is naturally lubricated. For this purpose, astringent injections may be applied. The most common is that containing the sulphate of zinc; and, for first use, not more than five grains of this salt should be dissolved in four ounces of water; but, the application may be afterwards strengthened. When this injection has little effect, another one, containing the oxymuriate of mercury, sometimes answers better, one grain of which, in eight ounces of distilled water, will form a fluid sufficiently strong for first employment. Another very good astringent injection, is composed of fourteen grains of plumbi superacetate dissolved in eight ounces of water.

As injections are only temporary applications, it is evident, that they ought to be very frequently used. At first, however, two or three times a day will suffice. The mouth of the syringe should not be pressed against the orifice of the urethra, as it creates a great deal of irritation, and sometimes ulceration.

When the strangury is severe, and there is trouble from nocturnal erections, chordee, &c. opium is to be prescribed.

After the inflammatory stage of the disease is over, the balsam of copaiva may be exhibited, or cubebs, which, indeed, has been recommended as a specific remedy for gonorrhœa, even in its early inflammatory stage. The dose is a dessert spoonful of the powder an hour before breakfast; a second, six hours afterwards; and a third, at bed-time. The powder is to be taken in water. If given while the discharge is considerable, and the inflammation great, the painful symptoms, it is asserted, will be removed in two days, and the discharge generally terminate on the third or fourth day. An antiphlogistic regimen is to be observed, and it is also necessary to continue



the powder, a day or two after the discharge has disappeared.\* The trials which I have made of cubebs, incline me to consider it as having similar virtues to those of the balsam of copaiva.

## CHAPTER XLV.

### GLEET, CHORDEE, SYMPATHETIC BUBOES, BLADDER AFFECTED IN GONORRHŒA.

SOMETIMES, after the cure of the specific inflammation of the urethra, upon which a gonorrhœa is supposed to depend, or after the removal of all acute inflammation, a discharge still continues, and, though unattended with pain, is often difficult of cure. A gleet is essentially different from a gonorrhœa in not being infectious, and in consisting of a discharge, which is composed of globules, blended with the mucous secretion of the part. On the other hand, in cases of gonorrhœa, the discharge has the power of infection, and is composed of globules, mixed with a serous fluid.

Stimulating injections may be tried. Two grains of the oxy-muriate of mercury, dissolved in eight ounces of distilled water, form a very suitable application. Injections frequently produce only a temporary cessation of a gleet, and the complaint soon afterwards recurs: patients, therefore, should not relinquish their use too soon, on the supposition of their being permanently well. It is generally advantageous to continue the use of the injection for two or three weeks, after the complete stoppage of the discharge. In some instances, sea-water makes a more efficacious injection than any other. It was very common formerly to introduce into the urethra bougies, medicated with turpentine or camphor, and about four or five inches long, with a view of irritating the lining of the canal, and altering the mode of action in the vessels. Of late years, however, the practice has gone a good deal into disuse, and this is a strong test of its not having been productive of more benefit than injections, which can be used with less trouble; and the probability is, that its efficacy has been in reality very inferior.

At the same time that injections are employed, the surgeon may direct the patient to take thirty drops of the balsam of copaiva thrice a day; or the tinctura lyttæ, beginning with a

\* See Adam's Short Account of Cubebs, as a remedy for Gonorrhœa, in Edinb. Med. and Surgical Journal, January, 1819, p. 61.

dose of ten drops thrice a day. If these medicines produce no good, though taken regularly for a week or ten days, they may be discontinued, as affording no hope of their becoming useful afterwards. Cubeb is also an exceedingly fit medicine for trial.

Many gleet will not yield to the above plan of treatment. Patients, so circumstanced, may try cold bathing (if possible, in the sea,) and rough horse-exercise. If debilitated, they should take bark and steel; and in inveterate cases, electricity, and even blistering the skin underneath the urethra, are recommended. Besides those gleet, which may be considered as the remains, or consequence of a gonorrhœa, there are others, which are of a very different nature, arise from other causes, and cannot possibly be benefited by the kind of treatment which is applicable to cases depending solely upon a wrong action of the secreting vessels of the urethra. The cases which I here refer to, are those which arise from strictures in the urethra, or from disease of the prostate gland. Here the gleet is merely an effect or symptom of the other more serious complaint, upon the removal of which, the cure of the discharge altogether depends. Hence, when the patient consults a surgeon for a gleet of long continuance, it is often prudent, in the first instance, to examine the state of the urethra.

#### CHORDEE.

In cases of gonorrhœa, when the inflammation is not confined merely to the surface of the urethra and its glands, but affects the reticular membrane, it produces in the latter part an extravasation of coagulating lymph, which unites the cells together, destroys the power of distention of the corpus spongiosum urethræ, and makes it unequal, in this respect, to the corpora cavernosa penis. Hence, at the time of an erection, a curvature takes place, termed a *chordee*. The concavity of the curvature is generally at the lower part of the penis.

When much inflammation is present, bleeding from the arm, and, more especially from the part itself, by leeches, is proper. The penis should be exposed for some time to the steam of hot water. Camphorated fomentations and poultices are also remedies, of which experience makes a favourable report. At the same time, opium and camphor may be given as internal medicines.

When all inflammation has been subdued, the indication is to promote the absorption of the coagulating lymph; and, for this purpose, nothing is better than frictions on the part with camphorated mercurial ointment.

#### SYMPATHETIC BUBO.

Gonorrhœa is sometimes attended with a swelling of the in-

guinal glands, termed a *sympathetic bubo*. This complaint is supposed to originate from mere irritation, and not from the absorption of matter. We know, that the lymphatic glands are capable of becoming inflamed in this manner; for, in various diseases, we see them frequently swell at a more remote situation from the thoracic duct than the local complaint, which is the exciting cause of their enlargement. The pain, which sympathetic swellings of the glands occasion, is much less than that arising from the true venereal bubo, and it was the opinion of Mr. Hunter, that they seldom suppurated.

Whatever may be the nature of a sympathetic bubo, certain it is, that mercury is by no means necessary or useful in the treatment. This is a fact, which may be considered as fully established, and confirmed by the experience of the most intelligent practitioners. The swelling may be diminished by the repeated application of leeches, and by keeping up a continual evaporation from the part, by means of linen, wet with the liquor plumbi acetatis dilutus. In short, the case is to be treated as a simple phlegmonous inflammation. When a poultice is found to afford more ease than cold applications, it is to be used.

#### BLADDER AFFECTED IN GONORRHŒA.

Opiate clysters, the warm bath, phlebotomy, if the patient be young and robust, and leeches applied to the perinæum, are the most eligible measures to be adopted. When this distressing affection continues very long, and is the only complaint, an opiate plaster may be applied to the loins, or a small blister to the perinæum.

Cicuta, bark, and sea-bathing, are also means which deserve trial.

When the bladder is extremely irritable, in consequence of a gonorrhœa, a scruple or drachm of the powder of uva ursi may be given, three times a day.

## CHAPTER XLVI.

### PHIMOSIS.

WHEN the opening of the prepuce is so much contracted, that the part cannot be easily drawn backwards, and the glans penis exposed, the complaint is termed *phimosis*. On the other hand, when the prepuce is pulled behind the glans, over

which it cannot be brought forwards again, the case is well known amongst surgeons by the name of *paraphimosis*.

Phimosis is either a defect with which certain individuals are born, or it is the consequence of inflammation of the prepuce. The first of these cases is commonly termed *natural* or *congenital*; the second *accidental*.

#### NATURAL OR CONGENITAL PHIMOSIS.

Infants are almost always born with the aperture of the prepuce so small, that the glans cannot be entirely uncovered; but, when such constriction does not exceed a certain degree, it should not be regarded as an imperfection; for it generally gets well of itself, as the child grows up, and approaches the age of puberty,—the period when erections begin to be strong, the penis to elongate itself, and the glans to dilate the prepuce.

The change, however, cannot happen when the opening of the prepuce is exceedingly small, and the frænum very short.

Even when the aperture of the prepuce is not particularly small, too considerable a length of the prepuce may prevent the removal of the constriction, in which case, the part yields in proportion as the penis becomes lengthened in erection, without the glans making any pressure against the contracted extremity of it, which, of course, remains undilated. Provided the urine can be discharged with ease, however, there is no absolute necessity for the opening of the prepuce to be made larger, before the period of life, when nature destines these organs for other functions, and to the performance of which the constriction of the prepuce is a great impediment.

Individuals, who naturally have the opening of the prepuce only half the ordinary size, are liable to another annoyance: the sebaceous fluid, which the glands of the corona glandis pour out, collects under the prepuce, and growing acrid, produces itching, inflammation, and a discharge of matter, very like that of gonorrhœa.

When this form of disease is unskilfully treated, the prepuce sometimes becomes adherent to the glans; a complication, which, from whatever cause it originates, is frequently troublesome and vexatious. Petit details several interesting examples of it.

He was consulted by one healthy young man, for a similar adhesion of the glans to the prepuce, but from a very different cause. The patient, when a child, five or six years old, used to wet his bed, and, in order to avoid the birch, and the anger of his parents, he took it into his head to tie up his yard with a piece of packthread. The night, on which this experiment was made, he succeeded in hindering the calamity which he so much feared; but he awoke in great pain, both from the tightness of the ligature, and from excessive desire to make water.



He now found, that he could not untie the packthread, for the double knot which had been made, as well as the circle of the string, was quite concealed by the swelled integuments, but he was afraid of complaining. His state, however, was at length betrayed by the increase of his sufferings. The family surgeon was sent for, who was obliged to cut the packthread with a bistoury, which could not be done without dividing the skin itself pretty deeply.

The child was at first unable to expel his urine: more than a quarter of an hour elapsed before he could do so, and then not before a catheter had been passed to dilate the constricted part of the canal; nor did the pain in the penis undergo any diminution until the bladder had been emptied. Applications for the prevention of mortification were now employed; but, notwithstanding their prompt use, gangrene took place in the situation of the ligature, and several sloughs afterwards separated. The prepuce and glans remained adherent to each other.

Some children are born with the opening of the prepuce so narrow, that the urine cannot be discharged without difficulty; and there are others, whose prepuce has no aperture at all; consequently, they cannot make water. Petit met with the latter sort of phimosis only twice; but the other case is frequent.

When the prepuce has no opening, the nurses and attendants are soon apprized of it by the linen continuing dry; by the infant being in pain and crying a great deal; and by the urine accumulating in the cavity of the prepuce, and occasioning so considerable a swelling, that the penis and scrotum are entirely hidden by it. The tumour is round, smooth, white, and elastic, like a hydrocele, which is very full and tense. As it is somewhat narrower towards the pubès, one might suppose, that it has a pedicle, but this smaller part of it is the penis, the integuments of which have yielded, and contributed to the enlargement of the swelling, in proportion as the urine has escaped from the urethra.

"If," says Petit, "I was surprised to see this tumour for the first time, the women, who had charge of the infant, were still more so: only two hours had passed since they had washed, cleaned, and bound it up in its swaddling clothes, and far from imagining the parts ill-formed, they had been pronouncing a very favourable opinion upon them."\* When the circumstance had been related to Petit, he knew the case immediately, and, dispelling the alarm of the attendants, he gave the child instantaneous relief by an operation, which will be presently noticed.

The other child, on whom Petit did a similar operation, was not quite so lucky. As soon as it had been baptized, it was

\* "Elles en avoient fait l'éloge, et un pronostic avantageux." *Traité des Maladies Chirurgicales*, t. ii. p. 428.

conveyed into the country; there was no time for ascertaining the nature of its complaint; and the nurse, who had not seen it before the journey, was compelled directly on her arrival home to undress it, as it had cried the whole way. She was very much astonished to find so large a swelling in the situation which it occupied; she, to whom a perfectly formed male child had been supposed to have been confided. She made the family acquainted with the occurrence, and sent for the surgeon of the village, who was as ignorant as herself of what the case was. However, he directed fomentations with warm wine, which was doing nothing; and the infant's belly grew tense and painful.

An aunt of the child's took Petit along with her to visit it, who saw the nature of the complaint, and by means of an operation, a pint of urine was let out. A cure was thus accomplished in so expeditious a manner, that the by-standers were nearly as much surprised at it, as they had been at the disease itself. Indeed, Petit reached the infant only just in time to save its life: for, when he entered the room, its respiration had nearly ceased, its body was livid, and its extremities cold, and covered with a clammy sweat. The instant after the operation, its plaintive cries stopped; it began to suck, and fell asleep.

Had the urine not been let out, the child must have perished with all the symptoms of a retention of urine; in fact it was such a retention, since the course of the urine was intercepted, with this difference, that the impediment to the exit of this fluid was neither in the bladder nor the urethra. The prepuce being impervious, the urine could not get out; the consequence was, that it had distended the bladder, the ureters, the kidneys, and the urethra itself, before producing an expansion of the prepuce. It was this part which made the longest resistance to the impulse of the fluid; but it had at length yielded, and been gradually dilated into a sac, or cyst, which was as large as a turkey's egg.

Petit assures us, that he has seen nearly the same thing happen, though the prepuce was not entirely closed, but its aperture smaller than that of the urethra, so that the urine could not get out of it as quickly as it came out of the latter passage. In cases of this description, the quantity which is ejected is less than what issues from the urethra, a portion of which lodges between the prepuce and the glans, and forms a tumour of greater or lesser size, according to the disproportion between the size of the urethra and that of the opening of the foreskin.\* In consequence of this repeated distention, if nothing be done for the patient, the prepuce becomes so elongated, thickened, and

\* Petit, *Traité des Maladies Chir.* t. ii. p. 430

relaxed, that its very size occasions considerable disfigurement. Sometimes, also, ulcerated openings are produced in it, from which, when it is compressed, the urine issues. In one such case on record, the swelling had become in a child two months and a half old, as large as a hen's egg, extending up to the symphysis of the pubes. The disease, which was not understood, was at first taken to be a cancerous tumour, that had destroyed the external parts of generation. As soon as its true nature was ascertained, the opening of the prepuce was dilated with a knife, when a large quantity of a clear gelatinous substance, with a small proportion of urine, was found lodged between the ulcerated glans and prepuce, and let out.\* But the above described grievances are not the only ones; for, the irritation of the urine, and of the sebaceous matter confined under the prepuce, may not only excite inflammation and ulceration of the part, and cause a complete retention of urine under the prepuce, but adhesions between the glans and the prepuce may be produced, which may afterwards prove a serious perplexity in any requisite operation. It should also be well remembered, that the impediment caused to the discharge of the urine, by the contracted state of the prepuce, may give rise to disease of the urethra and bladder.†

In children it is absolutely necessary, that the opening of the prepuce should be at least equal in size to that of the urethra; and, in adults, the same opening must be such as will allow the glans readily to pass through it, even when the latter part is enlarged, as it always is when the penis is erected.

A woman brought a little boy, six years of age, to M. Petit: the opening of the child's prepuce was so small, that considerable pain was suffered in making water. As the urine did not find its way out as fast as it issued from the urethra, the cavity of the prepuce was immediately filled with it, and a large swelling was produced, even before a drop had been voided externally. When the cyst was full, the child began to be in pain, and the urine to spirt out to a great distance, though in a very small stream. Petit operated on the boy, who was cured in a few days.

Another child was brought to Petit with the same disease, attended with a collection of urinary calculi in the cavity of the prepuce. One of these, about two lines in length, and shaped like a grain of oats, had insinuated its small end into the aperture of the prepuce, and thus intercepted the course of the urine. Petit tried to extract it; but it slipped away under the foreskin,

\* This case was originally communicated to the Academy of Surgery at Paris, and is quoted by Chopart in his *Traité des Maladies des Voies Urinaires*, p. 428.

† See Richter's *Anfangsgr. b. vi. p. 191.*

and the child was then able to make water better. In this case, the operation was also done, the calculi taken out, and the boy cured in a very short time.

In all these cases, the prepuce continues full of urine, though there may be none in the bladder: and, in order to complete the evacuation, the children are obliged to empty the prepuce by squeezing it with their hand. However, they can never get out every drop, either because, when the prepuce is compressed, a part of the urine is forced back into the urethra, or because there are calculi within the prepuce, which hinder it from being exactly compressed.\*

#### ACCIDENTAL PHIMOSIS

Is a constriction of the prepuce, formed subsequently to birth, and it usually arises from an inflammation and thickening of the part, by which its aperture is considerably diminished, while, from the very same irritation that produces this effect, the glans penis is itself often swelled and turgid, by which the difficulty of making it pass through the constriction is naturally augmented.† It may be right to notice, however, that patients rarely become affected with an accidental phimosis, unless they have a natural disposition to the disease; and it was observed by Petit, that in such individuals as are troubled in this manner, the prepuce was naturally tight and very long.‡ When the opening of the prepuce is only just sufficient to let the glans pass through it, or when the glans cannot be made to pass through it without force, the prepuce sometimes cannot be brought forward again over the glans, and a paraphimosis is the consequence. Or, supposing the prepuce can be made to cover the glans again, the slightest inflammation, or the least swelling, will hinder the glans from being denuded, and thus a phimosis commences. But, when the opening of the prepuce is capacious, a certain degree of inflammation and swelling may prevail, without preventing the glans from being uncovered.

In general, ulcers do not produce a phimosis, except when they attack the prepuce itself, and particularly the margin of its opening. If the complaint has sometimes been brought on by chancres of the glans, it has almost always been when these

\* J. L. Petit, *Traité des Maladies Chir.* t. ii. pp. 421-432.

† "Ce sont les chancres et les poireaux vénériens qui rendent le phimosis compliqué, &c. Le gonflement qu'ils attirent sur le gland et sur le prépuce augmente le volume de l'un et l'étroitesse de l'autre, de sorte qu'ils se gênent réciproquement."—Sabatier, *Médecine Opératoire*, t. iii. p. 325. ed. 2. "Speciales morbi causæ sunt omnia, quæ glandis volumen augent, aut tumorem, vel stricturam præputii inducunt."—Callisen, *Syst. Chirurgiæ Hodiernæ*, vol. i. p. 281. Hafniæ, 1798.

‡ T. ii. p. 433.



sores have been situated upon the corona glandis, where the membrane of the prepuce is reflected, or else upon the frænum, which is only a duplicate of the same membrane.\*

Phimosis is often brought on by severe gonorrhœa, and even by warts, when they are large and ulcerated. The same effect is also frequently produced by simple excoriations, which arise from the confinement and acrid quality of the sebaceous matter secreted around the corona glandis. A phimosis, with swelled testicle, has been known to originate from a blow,† though, on receiving information of such a cause, I should be very suspicious of a gonorrhœa being the original complaint. In short, both the phimosis and paraphimosis, which happen subsequently to birth, are occasioned by some species of irritation, producing a thickening of the cellular membrane of the prepuce, and sometimes also an increase in the size of the glans itself.‡

The inflammation of the prepuce is sometimes violent, and of the erysipelatous kind; while, in other instances, the part has an anasarctous appearance, owing to the extravasation of serum.

Phimosis is not unfrequently the cause of very bad consequences, especially when it is attended with chancres behind the glans; for the latter part, being situated between the sores and the orifice of the prepuce, may hinder the pus from finding its way out. The result is, that the discharge accumulates behind the corona glandis; this peculiar kind of abscess then excites ulceration on the inside of the prepuce, and, when it bursts, the glans often protrude through the opening, throwing the whole prepuce to the opposite side.§

Mr. Travers has correctly pointed out the evils, which may arise in certain cases of phimosis, from extravasation of the urine. In some instances, the tension of the parts is relieved by the sloughing of the glans penis, and the urine, insinuating itself into the elongated prepuce, gives rise to circumscribed ulcers of the part, by which it is discharged. In other examples, where the mouth of the prepuce is closed by adhesion, and a retention of urine ensues, ulceration, both of the prepuce and urethra, takes place, the urine is extravasated in the cellular membrane, and the body of the penis is sometimes denuded by gangrene even to the pubes. A state of phimosis is also described, where the swelling is excessive, so as to compress and partially stricture the urethra, and which, if unrelieved,

\* Petit, *Traité des Maladies Chirurgicales*, t. ii. p. 434.

† Travers, in *Surgical Essays*, part i. p. 135.

‡ In children who have calculi in the bladder, the sympathetic irritation experienced at the glans penis, frequently makes them pull their prepuce, by which means it is very much lengthened, and disposed to phimosis.

§ Hunter's *Treatise on the Venereal Disease*, p. 223, edit. 2.

tends to ulceration of that canal, extravasation of urine, and gangrene.\*

In numerous books, we find it stated, that both phimosis and paraphimosis are commonly owing to the venereal disease. From the preceding account, however, it is sufficiently clear, that any cause, occasioning an inflammation and swelling of the prepuce, and a consequent diminution of its aperture, whether attended with an increase in the size of the glans, or not, may give rise either to a phimosis or paraphimosis; and that, of whatever nature the cause may be, the effect itself is always quite free from syphilitic infection. In a word, it is a simple, inflammatory thickening of the prepuce, producing a diminution in the capacity of its orifice, so that when such orifice is in front of the glans, this part cannot be uncovered, and when behind, it cannot be covered again, and a more or less dangerous constriction is made round the penis by the contracted part of the foreskin.

#### OF THE TREATMENT OF THE NATURAL, OR CONGENITAL PHIMOSIS.

It is an established maxim in surgery, that in these cases, no operation should be practised upon children, unless great inconvenience from the impediment to the discharge of the urine be suffered; for experience fully proves, that the constriction generally undergoes a natural removal as the patient approaches the adult age. The causes of this change I have already touched upon in the preceding part of this chapter, and, in addition to what has there been stated, it is to be recollected, that as, at this period, the organs of generation are undergoing considerable development, the prepuce will the more readily accommodate itself to the size of the glans.

When, however, the prepuce is either imperforate, or so contracted in an infant, that the urine cannot be voided at all, or not without more or less pain, difficulty, and distention of the foreskin into a considerable cyst, the sooner an operation is performed the better. In the first case, indeed, the practice is immediately necessary for the preservation of life. Also, if the constriction of the prepuce does not disappear at the approach of manhood, but continues to be a serious obstacle to the additional function for which the organ is then designed, the surgeon should not hesitate to recommend an operation.

When the tightness of the prepuce is not very great, trials have occasionally been made to effect its dilatation with mechanical contrivances: and Trew, a practitioner at Nuremberg,

\* Surgical Essays, part i. pp. 136, 137.

invented an instrument with branches, which could be expanded in the degree required, and which were calculated for holding the part in a dilated state.\* Lassus used this instrument with success on a young man who was about to be married, but could not be prevailed upon to bear an incision: it was unremittingly worn about three weeks, at the end of which time the constriction was obviated.† The plan, however, has generally been found much more painful than the use of the knife, and, being tedious and uncertain, has little or nothing to recommend it.

There are two methods of operating for the cure of phimosis; in one, the surgeon amputates the whole of the constricted portion of the prepuce, by the performance of circumcision; in the other, he opens the prepuce by a simple longitudinal incision. In the generality of cases, the first practice is much better than the second, which always leaves two flaps, which are not only a disfigurement, but a real inconvenience, and sometimes an obstacle in coition. Indeed, the deformity of the prepuce, occasioned by this plan of operating, and the annoying friction, to which the angles of the part are continually exposed, have been such as to make some patients desirous of having the prepuce united again. One patient, who was thus incommoded, was advised by Fabricius ab Aquapendente to submit to an operation resembling that for a hare-lip;‡ but the author does not state whether it was actually performed. Bertrandi, however, was acquainted with a surgeon at Paris, who endeavoured to reunite the parts by means of the twisted suture, but could not succeed.§ Such indeed are the unpleasant effects which often follow the operation of slitting open the prepuce, that the method is sometimes modified by combining with it the removal of the two flaps, or angles of the skin. The latter plan, however, can only be regarded as a less simple, and more imperfect and painful kind of circumcision. It is, in fact, a double operation. But I would not wish to be understood to say, that the amputation of the two angles is not necessary, nor advantageous, if the operation of slitting open the prepuce be adopted. On the contrary, I am inclined to think, that, under these circumstances, it is right, especially if the prepuce be very long, as well as contracted.

\* *Acta Physico-Medica Acad. Naturæ Curios.* t. ii. obs. 48, p. 110. The instrument is represented in Heister's 26th plate, fig. 5, vol. ii.

† *Pathologie Chir.* t. ii. p. 478. 8vo. Paris, 1809.

‡ *De Chirurg. Operationibus*, cap. 61.

§ "Un chirurgien de mes amis, à Paris, ayant fait en pareil cas cette suture, eut le déplaisir, et le malade la douleur, d'en voir les points déchirés par un priapisme malencontreux." *Traité des Opérations de Chirurg.* p. 238.

As Richter observes, we may the more readily decide to give the preference to circumcision, because, in many patients, the prepuce is of extraordinary length, from having been repeatedly distended with urine, and, after the operation, so considerable a portion of it still remains, that one can scarcely perceive that any of it has been cut off. Frequently, the surgeon may remove half an inch or more of the foreskin, without the part being afterwards at all too short.\*

In all common cases of natural phimosis, the best modern operators in this metropolis, and many excellent surgeons abroad,† prefer circumcision. The prepuce is taken hold of with a pair of forceps, and as much of the part being left out as seems necessary to be removed, the surgeon cuts a complete circle of the prepuce off by one stroke of the knife, guided along the forceps as a pencil is along a ruler, and if the inner membrane of the prepuce should appear still to be too tight, it must be divided with a curved knife. The external skin of the part is then usually prevented from becoming separated from the inner layer by a fine suture, introduced through both their edges, and simple dressings are applied. In the cases which have fallen under my observation, it has seldom been necessary to tie any vessel. Bertrandi cut off the whole prepuce in three instances, but without any bleeding of importance.‡ A small linen cap, made to fit the part, will be found very convenient for keeping on the dressings; it is to be pinned to a bandage applied round the waist, and taken off when the patient has occasion to make water.

In applying the forceps, it should be recollected, that the upper part of the prepuce is quite unconnected to the glans, and longer than the lower part, which is also connected with the frænum; thence, the surgeon always finds it necessary to leave more of the upper portion of the prepuce out of the forceps to be cut off with the knife, than that part of it which joins the frænum. Particular care should invariably be taken, however, to leave out for removal all such portion of the prepuce as is too tight, preternaturally thickened, redundant, or diseased; for, if this object be not properly fulfilled, the inflammation subsequent to the operation will be liable to bring on a greater constriction, or even an entire closure of the prepuce, urgently re-

\* Loder, Chir. Med. Beobachtungen, p. 86.

† Richter, Anfangsgr. b. 6. p. 192. Loder, Chir. Beobachtungen, b. i. p. 86.

‡ *Traité des Opérations de Chirurgie*, p. 243. In a few instances, however, the hemorrhage proves troublesome; it may happen two or three days after the operation; and when it resists the usual means, constant pressure kept up with the finger will stop it. Loder, lib. cit. pp. 86-88.



quiring a second operation, which now must unavoidably be that of slitting open the part.\*

It is not a great many years since the general practice was to slit open the prepuce with a narrow, sharp-pointed, curved bistoury; and it was in this way that Petit operated, in the cases to which I have requested the reader's attention in a foregoing part of this chapter. The anterior part of the prepuce is first to be taken hold of with the left thumb and forefinger, by which means it will be rendered tense, the requisite instruments be more conveniently introduced, and the part more easily divided. When the opening in the prepuce is very small, a probe must be introduced, and, with the aid of this, a grooved director: the probe is then to be withdrawn, the knife passed along the director as far as the corona glandis, and its point being pushed from within outwards, all such portion of the prepuce is to be divided by one stroke, as is within the grasp of the instrument.

With respect to the best place for the longitudinal incision of the prepuce, some diversity of opinion prevails amongst surgical writers. Some recommend the upper part of the prepuce; others prefer one side of it.† It was the fear of hemorrhage which mostly led surgeons to adopt the latter mode. But, as I happened to serve an apprenticeship to an hospital-surgeon, who was exceedingly partial to the method of slitting open the prepuce at its upper part, I can affirm with Petit, that the hemorrhage may always be stopped by proper management, and that it is not this consideration by which the situation of the incision ought to be determined.‡ The true reasons, by which a decision should be formed, are the advantages, which are to be derived from one method or the other. If a longitudinal division of the prepuce is to be made, it is clear, that it is more advantageous to let the incision be at the upper part of the prepuce, opposite the middle of the glans, than on one side. First, because the two flaps being equal, the glans can be more rea-

\* See Richter's *Anfangsgr.* b. vi. p. 193.

† "It is much safer to make the wound on one side of the prepuce than upon the upper part; for, I have sometimes seen the great vessels on the dorsum penis afford a terrible hemorrhage." Sharp's *Treatise of the Operations*, chap. ii.

‡ Vol. cit. p. 440. I am far, however, from meaning to question the accuracy of Mr. Sharp's statement, that very troublesome bleedings may ensue. On the contrary, I have seen them happen; but they were invariably stopped by pressure, and cold applications. In whatever way the phimosis is cut, the hemorrhage will sometimes be profuse, and break out again from time to time, for some days after the operation. We see from Loder's experience, that the hemorrhage after circumcision may be troublesome, but that it can always be stopped by pressure with the finger. See his *Chir. Med. Beobacht.* p. 85.

dily uncovered, than when one flap is small and the other large. Secondly, because making one or two lateral incisions occasions greater deformity, and is prejudicial to the functions of the part. Petit was consulted by several persons, who had their prepuces slit open on one side, or both sides; and the annoyance which they suffered, made it requisite for them to submit to the following treatment:—

When the prepuce had been slit open on both sides, the intervening flap was removed with a stroke of the knife; but when only one lateral cut had been practised, Petit introduced a bistoury under the flap, and divided it longitudinally at a point corresponding to the situation of the former incision on the opposite side; the operation was then finished, by detaching the piece of the prepuce, between the two cuts, altogether from the penis.\*

OF THE METHOD OF OPERATING, WHEN A PHIMOSIS IS COMPLICATED WITH ADHESION OF THE PREPUCE TO THE GLANS.

Although this case is more frequently the consequence of an accidental phimosis, which has been attended with inflammation, excoriations, and ulceration, than the congenital form of the disease, experience proves, that it may follow either case, when the parts are subjected to any causes capable of producing inflammation of the prepuce and glans. This complication of phimosis particularly deserves the attention of the practical surgeon, because it is an example, which, when an attempt at cure is deemed advisable, and the adhesions are extensive, or particularly situated, may compel him to deviate from the good general rule of giving a preference to circumcision. Or, if that be inadmissible, the state of the disease may oblige him to abandon the approved maxim, of always making the longitudinal cut in the prepuce exactly in the centre of its upper part.

Petit had occasion to operate in two cases, attended with a good deal of difference. In one, the phimosis was not adherent to the whole surface of the glans, and a probe could be introduced between it and the prepuce, but all the anterior part of the prepuce being adherent to the glans, a probe could be passed in only at the side. Here Petit was obliged to divide the prepuce with a bistoury and director. The small flap was not adherent, but the large one was universally so, and it was necessary to detach it, by drawing it in one direction, and the glans in the other, which could not be done without considerable pain. The separation was accomplished partly by tearing the adhesions, and partly by cutting them. After the glans had been cleared as far as the corona glandis, the large flap was

\* Petit, *Traité des Mal. Chir.* t. ii. p. 441.

diminished, by removing part of it in the manner above related.

In the other case, neither a director nor a probe could be introduced, and the disease gave a vast deal of trouble and pain. Petit made an assistant pinch up the skin of the prepuce on one side, while he did the same thing himself on the other side. He then made a longitudinal incision in the middle, through the prepuce, down close to the glans, which, however, he avoided injuring. In order to discern the membrane of the glans better, the angles of the wound were now drawn in opposite directions, and by patient and careful dissection, Petit succeeded in detaching the prepuce from the glans, without hurting the latter. The operation is acknowledged, however, to have been extremely painful, as the prepuce could not be separated from its connexions without forcibly pulling it, and the proceeding is compared to the skinning of an eel.

Though Petit may be adduced as an authority for attempting to separate the prepuce from the glans, when the adhesions are so firm and extensive, that no instrument can be introduced, yet, we find, that he could not do what he did, without the utmost difficulty to himself, and pain to his patient. Hence, it may generally be as well not to be anxious to undertake an operation in these circumstances, and, except the patient be very urgent himself, it may be prudent at most only to make such an incision, as will suffice for removing any impediment to the exit of the urine. Richerand positively assures us, that experience has convinced him, that the operation for the relief of phimosis, in individuals past the age of puberty, is always ineffectual, when adhesions exist between the glans and prepuce.\*

#### OF THE TREATMENT OF ACCIDENTAL PHIMOSIS.

From the extensive sloughing, which I have frequently seen follow operations performed on the prepuce, during its inflamed and œdematous state, in cases of phimosis, I have no hesitation in asserting, that such practice is generally very injudicious. If we exclude the particular instance, in which purulent matter accumulates under the prepuce, and cannot make its exit, except by an ulcerative process, an inflamed phimosis can rarely, or never, require the employment of the knife.

The cases, which require an operation, are such as are natural, and do not amend as the patient becomes an adult; such as occur without acute inflammation, and, according to all appearance, spontaneously; and others, which arise from the puckering of the prepuce, in consequence of former ulcerations.

The inflammation of the prepuce, occasioning an accidental

\* Nosographie Chirurgicale, t. iv. p. 329, edit. 4.

phimosis, may depend upon various causes; for instance, simple excoriations, or superficial ulcerations produced by the confinement and irritating quality of the secretion from the sebaceous glands; the same effects, resulting from commerce with women affected with fluor albus: the inflammation and swelling of the prepuce and glans may also originate from a severe gonorrhœa; from the irritation of chancres, or other ulcers, especially those which are situated upon the inside of the prepuce, upon the frænum, or behind the corona glandis. The pressure and irritation of large warts, growing from the glans, are likewise another occasional cause of a phimosis, attended with inflammation.

All these examples, if neglected, or badly treated, may bring on extensive ulceration, and even mortification.

With respect to the treatment of the phimosis from simple excoriation, and the irritation of the natural secretions lodged under the prepuce, the principal indications are, to wash away the acrid matter by injecting tepid water, or the diluted liquor plumbi acetatis, and to have recourse to common antiphlogistic means; cold applications to the inflamed prepuce; or the immersion of the penis several times a day in warm water; rest; saline purgatives; low diet; and, if necessary, leeches and venesection. In all severe cases of phimosis with inflammation, great benefit may also be derived from supporting the part at an angle upwards from the symphysis of the pubes.\*

The phimosis, originating from virulent gonorrhœa, chancres, or other sores, may require, in addition to local and general bleeding, warm emollient poultices, containing laudanum. Great relief will frequently be produced by the application of the steam of hot water, or of vinegar and spirit of wine, to the inflamed prepuce. But nothing is more essential, than repeatedly injecting tepid water under the foreskin, for the purpose of cleansing the sores, and washing away their discharge, or the matter which issues from the urethra; and, when the fluid is thrown out of the syringe, the orifice of the prepuce should always be gently compressed, so as to let the injection pass freely about between the glans and prepuce, before it is discharged.

In cases of chancres, Richter recommends a lotion, which is composed of twelve grains of opium, three grains of the submuriate of mercury, and six ounces of water. This is both to be injected under the prepuce, and applied to its outside, by means of linen kept constantly wet with it.

In cases of gonorrhœa and chancre, a phimosis may often be

\* See Richter's *Anfangsgr.* b. vi. p. 200; Götting. 1802; and Travers, in *Surgical Essays*, part i. p. 188.



foreseen and averted, by directing the patient to draw back the prepuce frequently, to wash and bathe the parts, keep himself quiet in a horizontal posture, and the penis directed upwards.

When a chancre is complicated with an inflamed phimosis, experience proves, that it is a most unnecessary and pernicious practice, to continue the exhibition of mercury, before the inflammation and swelling of the prepuce have abated. A modern surgeon, indeed, lays it down as a general rule, that the constitutional administration of this mineral is always inadmissible, during the existence of active inflammation in cellular textures.\* The truth of this observation, as far as the inflamed prepuce in cases of chancre is concerned, I have had many opportunities of ascertaining, and, I believe, that, next to the rash employment of the knife, nothing has a greater tendency to make the sore spread and slough. Besides, in deferring the exhibition of mercury under these circumstances, we need not be frightened with the idea, that the sores must continue to get larger, and that the constitution will become more and more infected; for, recent investigations into the nature of syphilis, fully prove its general curability without any mercury at all, and that, contrary to opinions once not unfrequently promulgated, it is not the character of this disease invariably to get worse and worse, and to proceed from one order of parts to another, with increasing malignity, though no mercury, and no particular medicines be administered.†

When the discharge from chancres or other sores is completely confined under the prepuce, Hunter sanctions the method of making a puncture into this peculiar kind of abscess with a lancet, and through this opening, suitable lotions may be injected. If no puncture be made, an aperture will be formed by ulceration, and through such opening the glans is liable to protrude, so as to throw the whole of the prepuce to the opposite side, and occasion serious deformity, as I have already explained. Should this change have already taken place, the best plan is to divide the portion of the prepuce intervening between the natural and ulcerated opening.

When the inflammation, swelling, and constriction of the prepuce diminish, and the sores begin to heal, the glans should now and then be uncovered, in order to prevent the formation of adhesions. If this precaution be neglected, the prepuce will sometimes become adherent at various points to the glans, and its orifice close so much, that the urine can hardly be discharged. In such a case, when the opening of the prepuce lies opposite

\* Travers, *Surgical Essays*, part i. p. 131.

† See the first part of this work, and Mr. Rose's paper in *Medico-Chir. Trans.* vol. viii.

that of the glans, Richter recommends us to introduce a bougie for the purpose of dilating it: but when it is situated laterally, more or less away from the orifice of the urethra, he considers the employment of the knife indispensable, though the difficulty with which the adherent parts are separable, is at the same time frankly acknowledged.\*

It is particularly in cases where an obstruction to the urine arises from the effects of the inflammation and swelling upon the extremity of the urethra, that a proposal has been made to have recourse to a small elastic catheter, with a view of preventing ulceration of that passage. With this treatment are to be conjoined fomentations and emollient poultices.†

In phimosis with inflammation, the operation of dividing or amputating the prepuce, may be set down as unnecessary, as long as the patient can void his urine, the matter find its way out, and the requisite injections be applied under the prepuce. How many times has it been my lot to see the prepuce slit open, for the sole purpose of examining and dressing sores under it! How many times have I seen this erroneous practice followed by a rapid extension of the ulcers, sloughing, and loss of the whole, or a considerable portion of the penis! Sores under the prepuce seldom essentially require any particular dressings, the very presence of which, in this situation, frequently produces all the irritation of a foreign body; and, if the ulcers be kept clean, by the frequent injection of tepid water, and the inflammation of the parts be appeased by proper antiphlogistic means, the treatment is complete, as far as local measures are concerned.

## CHAPTER XLVII.

### OF PARAPHIMOSIS.

By the term, *paraphimosis*, surgeons generally understand that particular case, in which the prepuce is drawn behind the glans penis, where the narrowest part of it produces such a degree of constriction round the penis, as occasions not only more or less difficulty in reducing the glans, but considerable pain, inflammation, and swelling, sometimes terminating, when the complaint remains for a certain time unrelieved, in the de-

\* Anfangsgr. b. vi. p. 200. † Travers, Surgical Essays, pp. 137, 138.

struction of the latter part, and also of the skin, including the prepuce, by a rapid species of gangrene.

Besides this form of paraphimosis, which is far the most interesting to the practical surgeon, writers comprehend under the same name other examples, in which the glans penis cannot be covered, merely because the prepuce is either too short, or altogether wanting. These cases are essentially different from the former, inasmuch as they are never attended with any constriction behind the corona glandis, nor of course with any urgent symptoms. This extraordinary shortness, or total deficiency, of the prepuce, is sometimes *congenital*, sometimes *accidental*, or the result of a more or less considerable loss of the part from circumcision, ulceration, or sloughing. When an individual is born with this kind of paraphimosis, it cannot be remedied by any applications, or operation; a fact, now completely established, notwithstanding it may not tally with the opinions of some of the ancient surgeons.\*

#### PARAPHIMOSIS ATTENDED WITH CONSTRICTION

Frequently follows phimosis, in consequence of the thickened and contracted prepuce being drawn back quite behind the glans, and not being immediately restored to its former situation again; or it may be induced by a naturally tight prepuce being forced behind the glans in coition, &c. In these circumstances, the constricted part of the prepuce acts as a tight ligature round the body of the penis, and seriously obstructs the return of blood from the glans, and from the portion of the prepuce which is beyond the stricture. Hence, the latter part is attacked with a considerable degree of œdematous inflammation, while the glans itself becomes greatly inflamed, its distention hourly increasing, and if speedy relief be not afforded, the parts are at length threatened with gangrene. When mortification takes place, however, it is generally the glans alone which is destroyed, and the dead part separates without further mischief; the sloughing not easily extending to the corpora cavernosa. In some instances, the prepuce sloughs, including that part of it which is directly concerned in producing the strangulation, and thus the cause of all the suffering, and inflammation, is removed by a natural process.

A simple paraphimosis, arising merely from the retraction of a tight prepuce, and not from a venereal cause, is not attended with so much risk of mortification of the glans, as is generally supposed. Loder furnishes us with an example, where the

\* "Si glans nuda est, vultque aliquis eam decoris causa tegere, fieri potest." Cornel. Celsus, lib. vii. cap. 25. Paulus Ægineta, lib. vi. chap. 53.

operation was not performed before the glans had been strangulated eleven days, and yet it had not sloughed.\*

Both the phimosis and paraphimosis occasionally arise from circumstances wholly unconnected with sexual intercourse, and, in proof of this statement, Mr. Travers quotes a remark from Mr. Latta. "Young boys frequently bring on a paraphimosis by retracting the prepuce in diversion, until they become unable to pull it forward again. As they conceal this for some time through fear, it is not uncommon for the parts to become inflamed and swelled to a great degree, and I have even found gangrene taking place, before the matter was found out."†

In cases of paraphimosis, the disease rarely ends in sloughing, unless the treatment has been injudiciously conducted, or the patient has long neglected to apply for surgical assistance. In general, also, the pain of the complaint, and the obvious inconvenience and deformity of a permanently exposed glans, and enormously enlarged prepuce, bring the disorder sooner than a phimosis to notice, while it is so easily reduced by the aid of timely scarifications of the swollen prepuce, fomentations, and compression of the glans, that it is rarely suffered to remain unrelieved.‡

In the treatment, the principal indication is to remove the stricture behind the glans as quickly as possible. Upon this point all surgeons may be said to be unanimous; but, with respect to the best and safest mode of accomplishing this desirable object, a difference of opinion prevails; some practitioners being advocates for the early use of the knife for the division of the stricture; others, sanctioning this practice only when other means fail.

Frequently the disease may be at once relieved, by compressing as much of the blood as possible out of the glans penis, and then pushing the part back again through the stricture. In order to perform this operation adroitly, the surgeon should first make continued pressure on the glans, by placing it between the ends of the thumb, index, and middle fingers of each hand. The whole surface of the part should thus be gradually compressed, at the same time, for the space of four or five minutes. Then, the two thumbs are to be employed in pushing backward the diminished glans, and the fingers, in drawing forward the prepuce.

The success of the preceding method is materially promoted by immersing the penis, for some time before the attempt at

\* Chir. Med. Beobachtungen, p. 90. 8vo. Weimar, 1794.

† Latta's Surgery, vol. i. p. 391.

‡ Travers, Surgical Essays, part i. p. 134.



reduction is made, in ice-cold water, until its size, and more especially that of the glans, are considerably lessened. In confirmation of the excellent effects of cold applications in facilitating the reduction of the glans in an early stage of the disease, we have the testimony of Callisen,\* who assures us, that, with respect to emollients, unless they quickly afford relief, they do harm. It is very common, however, to see practitioners of eminence and talent, prefer in these cases warm applications to cold; and fomentations, scarifications of the swelled prepuce, or leeches applied near it, venesection, compression of the enlarged glans, and other common antiphlogistic measures, may be said to form the outline of the ordinary treatment of paraphimosis; nor can it be doubted, that the plan is generally successful. At the same time, I believe, that at least an equal degree of success would be experienced, if ice-cold water were substituted for the fomentations.

Richter is very partial to the early use of the knife, as the surest and most expeditious mode of relieving paraphimosis after the disease has attained a certain degree. In doing this operation, the surgeon is to remember, that the narrow opening of the prepuce usually lies, like a tight cord, in a depression extending round the penis, while the glans, and the portion of prepuce which is situated between the glans and the constriction, is placed behind the latter part, in the form of a thick swollen mass of flesh, so that it is frequently quite impossible to introduce any knife under the stricture, for the purpose of cutting it from within outwards.

The best way of performing the operation is to lift up the skin of the penis into a fold, close behind the stricture, where it is always loose and movable, and then to cut through the part which is raised. A small blunt-pointed director is next to be introduced through the wound into the cellular substance, and carried forwards under the constriction, until its extremity can be plainly felt on the side towards the end of the penis, when the surgeon is to cut into the groove of the instrument, and thus divide the stricture. After the constriction has thus been obviated, the prepuce cannot always be immediately brought forwards over the glans, and, perhaps, in cases where the operation has been absolutely necessary, it is never at once practicable. Here, as Richter observes, the prepuce is usually so inflamed, indurated, thrown into adherent folds, fixed, and enlarged from the effects of the constriction, that every endeavour immediately to cover the glans with it must be fruitless. The attempt is also unnecessary: it is quite enough that the constriction has been removed; and the surgeon need not be in

\* *Syst. Chirurgiæ Hodiernæ*, vol. i. p. 285. Hafniæ, 1798.

a hurry to cover the glans. From the moment that the operation is finished, the symptoms begin to subside; and, as soon as the inflammation and swelling have entirely disappeared, the prepuce falls of itself over the glans.\*

## CHAPTER XLVIII.

### AMPUTATION OF THE PENIS.

IT is very generally set down in surgical books, that cancer, and mortification,† of the penis, are the two cases for which this operation is required. That the first disease is frequently a proper reason for amputating the penis, is unquestionable; but, that mortification is so, every reflecting surgeon will deny. The mortified part will separate, and the living surface cicatrize afterwards, fully as well, as if the patient were to submit to a painful operation.

I am glad to have it in my power to adduce, in support of the foregoing remark, the sentiments of the experienced and judicious Loder, who unequivocally declares, that, in examples of mortification, he would never undertake the operation. When the gangrenous mischief, says he, is spreading, amputation will be of no use, because it will not stop the disorder; but if the mortification has ceased to extend itself, the operation will be superfluous, as nature herself will throw off the dead parts.‡

When the case is a scirrhus, or cancerous disease, the prospect of a perfect cure will greatly depend upon the testicles, skin about the pubes, and glands in the groin, being free from

\* See Richter's *Anfangsgr.* b. vi. p. 206. "The œdematous swelling of the prepuce, (says Loder,) sometimes prevents, for a couple of days, this part from being put over the glans, though the stricture has been completely removed by the operation. By the continued use of the diluted liquor plumbi acetatis, this swelling may be got rid of; but, should it last longer, a scarification or two with a lancet will be requisite." *Chir. Med. Beobachtungen*, p. 87.

† In mortification from paraphimosis, or other causes, the operation is recommended both by Heister, (*Institut. Chir.* 816,) and B. Bell, (*Syst. of Surgery*, vol. i. p. 538.) Richter deems the operation unnecessary for the separation of the slough; but thinks the knife may sometimes be requisite for making the end of the stump equal, when it has healed with inequalities. However, beauty seems to me a subject here not worth considering, at least in a surgical point of view.

‡ *Chir. Med. Beobachtungen*, p. 79.

induration.\* I have now seen this operation performed three times, and, in the first instance, the disease had extended to the testicles and inguinal glands, so that though the patient got rid of the disease, situated on the penis, the disorder continued to increase in the groin and scrotum, until life was exhausted.

As the serious mistake has sometimes happened, of amputating the penis for a disease, which, on further examination, appeared to be of a very simple and curable nature, surgeons cannot be too cautious in the investigation of the circumstances of the complaint for which the operation is proposed. In particular, they must carefully distinguish the cancerous disease of the penis from the more common warty excrescence. "I have seen (says Mr. C. Bell,) a man just about to lose his penis, on account of a combination of phimosis with these warty excrescences from the glans, and which had burst through the prepuce with a very malignant-like distortion. But the prepuce being freely cut open, the luxuriant crop of harmless warty excrescences started forth."†

It is certainly true, also, that the penis has been cut off, when the prepuce was the only diseased part. What are commonly (but as I conceive incorrectly) termed *venereal* warts, are well described by the latter writer: they have a spreading, mushroom-like top, and slender base; and if the intermediate parts can be seen, they retain their natural appearance. A tubercle, formed on some part of the prepuce, is often the beginning of cancer of the penis: it is at first, as Mr. C. Bell remarks, an irregular warty excrescence, with a broad base in the substance of the prepuce, or on the frænum. In a more advanced and ulcerated stage, the sore is of a dark red colour, covered with a sanious discharge; its bottom is solid, and deep excavations, and irregular cauliflower excrescences, present themselves. The neighbouring skin, of a purple colour, indurated, swelled, and tuberculated, stands out from the sore, while its irregular edge is turned inwards. The discharge has a peculiar smell, being highly offensive, and when the urethra is ulcerated, the urine gushes out from preternatural openings.‡

Cancer may also commence upon the glans, as happened in the very first case, in which I had an opportunity of seeing an amputation of the penis done. The disease here also usually begins in the form of a wart, or small, not very troublesome, induration, which gradually changes into a most painful ulcerated excrescence. Sometimes, as Richter informs us, the greater part of the penis is covered with such excrescences, the can-

\* See NOTE H.

† Operative Surgery, vol. i. p. 130. 8vo Lond. 1807

‡ Op. cit. vol. i. p. 131.

cerous nature of which is particularly indicated by the deep extension of their bases into the substance of the parts from which they grow, the parts appearing for some depth to be converted into a similar hardened mass to themselves. I have seen the whole glans, and part of the corpora cavernosa,\* changed, in this manner, into a firm incompressible substance, which had been gradually extending itself for years, the glands in the groin being also diseased in the same way.

Sometimes, after the prepuce has been slit open for the relief of a congenital phimosis, a large irregular fungus sprouts out from the extremity of the penis, and continues spreading until it has occupied all that part of the organ, which naturally projects beyond the scrotum. Frequently, in these circumstances, neither the prepuce, nor the glans, can be distinctly perceived; but the whole projecting part of the penis forms a confused mass of irregular granulated flesh, discharging a very fetid matter.† It would appear from several of the cases recorded by Mr. Hey, that tubercles, or excrescences, actually existed within the prepuce before the operation, and were found there as soon as the phimosis was cut.‡ What is likewise remarkable, is the great frequency, with which the cancerous disease of the penis seems to be attended with, or preceded by, a congenital phimosis. Mr. Hey found this to be the case in seven out of nine examples which fell under his notice, and, says he, “where I had an opportunity of seeing the disease in an early stage, the phimosis evidently appeared to have been caused by an unnatural formation of the internal membrane of the prepuce; and this formation seemed also to have given rise to the cancerous affection.” The facts, brought forward by this gentleman, tend to prove, that this malignant affection mostly commences upon the prepuce, and that, in its earliest stage, the whole lining of that part is studded with minute tubercles, or inequalities, which change into the worst kind of disease.

According to Mr. Travers, a malignant ulceration of the prepuce and penis, following phimosis, and requiring amputation, may be brought on by an indiscreet perseverance in the use of mercury during the period of inflammation.§

Whenever excrescences on the penis have a narrow base, they may be cured by cutting them off, and the amputation of that organ is totally unnecessary, and of course improper.|| This I consider more judicious treatment, than applying to them a solution of the oxy muriate of mercury and opium for

\* See Case in Hey's Practical Obs. in Surgery, p. 463, edit. 2.

† Ibid. p. 461, edit. 2.

‡ See Cases, pp. 463, 473, &c.

§ Surgical Essays, part i. p. 152.

|| Richter, Anfangsgr. b. vi. p. 183. Gottingen, 1802.



their cure, under the idea of their being venereal. Also, when the wart or excrescence is of a malignant kind, but limited to the prepuce, a cure may generally be effected by a removal of the part, without touching the glans or body of the penis itself.\*

Lastly, it is to be recollected, that diseases of this organ, which had put on a most malignant appearance, have sometimes been cured by the carrot-poultice,† and the internal and external use of arsenic.

In the operation, the plan of saving as much of the penis, and also of the glans, as circumstances will allow, with due regard to the entire removal of every particle of the disease, is undoubtedly entitled to commendation;‡ because the longer the stump is left, not only the more conveniently will the urine afterwards be discharged, but even the faculty of generation be more likely to be preserved. In confirmation of the latter point, the testimony of Heister might be adduced, and Loder mentions one example, in which the patient retained the power of propagating after amputation of the whole of the glans.§

Amputation of a cancerous affection of the penis often effects a cure, relapses being much less frequent, than after the generality of operations for the removal of cancerous parts. In the three first cases published by Mr. Hey, the cure after the operation was permanent.|| In order to ensure this success, however, it is essential not to defer the use of the knife until the

\* See Case in Hey's Practical Obs. p. 473, edit. 2.

† Gibson, in Med. Obs. and Enquiries, vol. iv.

‡ {The following method is adopted by M. Lisfranc, of Paris, to discover to what depth cancer of the penis extends, and whether the diseased parts may not be completely removed without amputating the penis. "M. L., in his clinical lecture, in showing a patient with cancer of the penis, took the opportunity of saying that he would put in execution an idea that he had long entertained, and which had been suggested to him from minute examination of some amputated cancerous penes. 'I have seen (says he,) penes enlarged to twice their natural size, and with all the symptoms of occult or ulcerated cancer: every thing announced that this frightful disease completely occupied the organ. They have been removed, and, on minute examination, the disease has been seen to be confined to the corpora cavernosa.' How are we to know that such is the case? There is but one way: it consists in making on the dorsum of the penis, parallel to the axis of that organ, an incision, which, beginning at the anterior part of the cancerous point, shall be continued to the posterior. The bistoury must be used with much caution and slowness, and, as the incision goes on, the parts must be cleaned with a sponge; and, the extent of the disease being discovered, a careful dissection of the diseased parts may save the penis. The only inconvenience resulting from this operation is the prolongation of the sufferings of the patient.—M. Lisfranc has twice put in practice this operation, and each time saved the member." Johnson's Journal, April, 1827.}

§ Loder, Chirurgisch-Medicinische Beobachtungen, b. i. p. 81.

|| Hey's Practical Obs. in Surgery, p. 478, edit. 2.

disease is no longer local, and the whole of it cannot be taken away. Hence, before determining to operate, it is a rule with surgeons carefully to examine whether the disease has extended to other parts, especially the glands in the groin. When they are indurated and enlarged, many good practitioners decline the operation altogether, the event of which is then always to be regarded as doubtful. Thus, in one instance, in which the glands of the groin were much tumefied, Mr. Hey ventured upon the operation, because the swelling of the glands did not exist before escharotics had been applied to the disease of the penis, and consequently it was dubious whether their enlargement was truly cancerous or not; but the patient died from a relapse. The inguinal glands lessened for a time, but afterwards increased considerably: there was, however, never any fresh ulceration.\* Sometimes the only part affected, in addition to the penis, will be the integuments covering the ossa pubis, in which situation a hard tumour is perceptible. In one case of this description, operated upon by Mr. Hey, a permanent cure ensued, care having been taken to cut out the swelling at the pubes: the wound here remained for some time foul; but, on applying to it red precipitate and burnt alum, it assumed a better appearance, and afterwards healed.† When the cancerous disease does not extend beyond the glans, immediately behind which the incision can be safely executed, there is no objection to the method of cutting through the whole of the penis, with one stroke of the knife. However, in order to cover the ends of the corpora cavernosa with integuments, the plan is sometimes followed of first drawing them towards the pubes, before the incision is made, or else of merely making at first a circular cut through the skin, which is next pushed a little way up towards the pubes, and the rest of the penis divided in a line with the edge of the retracted skin. This last way of operating, however, is not approved of by the generality of modern surgeons; for it is slower, and more painful, than a direct incision through the whole organ; it does not shorten the cure, and is liable to inconveniences. If, indeed, the preservation of skin for covering the end of the stump were any real advantage, the surgeon would always have enough for this purpose by cutting straight through the part, because the corpora cavernosa constantly shrink towards the pubes as soon as they are cut through, and leave the integuments projecting. But the truth is, no benefit is derived from the redundancy of skin: in one case, Mr. Hey made an attempt to heal the wound by the first intention, and, with that view, brought the integu-

\* Hey's Practical Obs. in Surgery, p. 470, edit. 2.

† Op. cit. p. 463.

ments over the divided corpora cavernosa, and, that he might make the integuments lie over the end of the penis without puckering, or covering the orifice of the urethra, he made a longitudinal division of them at the inferior part of the penis, and introduced a small silver cannula into the urethra. "I was disappointed," says he, "in my design of healing by the first intention; for the integuments would not adhere to the extremity of the corpora cavernosa. These spongy bodies, when divided, do not readily throw out granulations; but have usually for some time an ill-conditioned appearance."\* An objection to amputation of the penis by the double incision is, that the superfluous flap of skin, further augmented by the natural retraction of the divided corpora cavernosa, renders it more difficult to secure the blood-vessels, which become concealed under it, and are disposed to retract, on account of the loose cellular substance with which they are surrounded. At all events, if the surgeon choose to save the skin, let him not prolong the patient's sufferings by two formal distinct incisions, with an intermediate dissection of the integuments from the corpora cavernosa, as it will be quite sufficient to draw the skin a little way towards the pubes, when the amputation may be completed with a single stroke of the knife.

When the penis is to be amputated near the symphysis of the pubes, the corpora cavernosa usually retract so considerably after their division, and lie so deeply concealed within the integuments, that the surgeon cannot discover, nor take up the bleeding vessels. In one example, says Richter, the arteries shrunk so far under the pubes, that they lay two inches within the extremity of the skin. Hence, in such an operation, instead of saving integuments, the surgeon should make a point of removing more of them than of the corpora cavernosa. This may always easily be accomplished, if the skin be drawn forwards towards the glans before the requisite division of the parts is performed; and if there were any difficulty experienced, it would be right to make the incision through the skin first, and cut through the rest of the penis afterwards, in such manner as would guard against too considerable a retraction of the corpora cavernosa.†

As the hemorrhage after amputation of the penis is profuse, and often cannot be effectually restrained, unless the larger arteries are secured with ligatures, it is a matter of great importance to do the operation in such manner, as will enable the surgeon to get at these vessels with the least difficulty; and hence the utility of abandoning the project of saving skin for

\* See Hey's Practical Obs. in Surgery, p. 469, edit. 2.

† Richter, Anfangsgr. b. vi. pp. 185, 186.

the purpose of covering the stump. Without this precaution, as a modern surgeon has remarked, while the tedious business of getting the ends of the corpora cavernosa from beneath the integuments, by which they are concealed, and of finding out the arteries, is going on, the continued bleeding often reduces the patient to the lowest state of weakness, and the practitioner is at last compelled to have recourse to compression, styptic applications, cold water, or the cauter. Nor are these means always capable of stopping the hemorrhage in time, or in a permanent manner, the effusion of blood ceasing only for a little while; and their irritation always increases the inflammation of the stump, and protracts the cure. Thus, in one example, where the hemorrhage was considerable, the blood flowing not only from many conspicuous arteries, but oozing largely from the divided corpora cavernosa, Mr. Hey took up one artery on the dorsum penis, and one in each corpus cavernosum. The bleeding, which still continued, seemed then to be a general oozing from the wound; on which account he applied sponge to it. But this would not do; for, about an hour after the patient had been put to bed, the bleeding burst out again, and Mr. Hey was therefore obliged to remove the dressings, and take up three other arteries. A fourth vessel, which run near the urethra, bled a little; but as its extremity could not be clearly seen, a piece of sponge was laid upon it. On the third day a fresh hemorrhage came on, which made it necessary to remove the last portion of sponge, and take up the vessel under it, which now bled freely.\* In another example, Siebold could tie only one artery, the others having shrunk so deeply, that they could not be discovered. After the patient had fainted, the bleeding stopped; but, it broke out again, and was at length checked with cold water. The weakness from loss of blood, was such, however, that the patient was a month in recovering his strength, and his feet continued for some time œdematous.† Joerdens saw a case in which the stump became retracted under the pubes, and a violent hemorrhage ensued, which nearly proved fatal, and could hardly be restrained in half an hour, by tying three arteries, and having recourse to compression, and a styptic liquor.‡ B. Bell was still more unfortunate; for he ventured to trust entirely to pressure, without taking up any of the vessels: the consequence was, that so copious a bleeding came on, a few hours after the operation, that the patient lost his life.§ In another case, the surface of the stump, which had been treated with compression and styptics, was long ill-conditioned, pale,

\* See Hey's Practical Obs. in Surgery, p. 465, edit. 2.

† Chir. Tagebuch, p. 52.

‡ Loder's Journal, 3 b. 1 st.

§ Syst. of Surgery, vol. i.



and indurated, nor did the wound begin to diminish at all before the thirteenth day,\* in which space of time, another instance, treated differently, had completely healed.†

It appears that the corpora cavernosa have the greater tendency to retract, the nearer their division is to the pubes; and, on this account, it is alleged that even when care has been taken to amputate more of them than of the integuments, their extremities will still frequently be deeply concealed, and the taking up of the arteries be difficult. Nor will the plan of encircling the stump with a tight piece of tape, here avail in obviating the disadvantage of the retraction of the corpora cavernosa, and the immediate danger of hemorrhage, as the stump is short, and the band therefore liable to slip off.‡ Even if the band could be fixed tightly on the part, it would only serve as a temporary means of stopping the bleeding, which would be renewed immediately the band was loosened for the purpose of enabling the operator to see the points from which the blood issues, so as to get at the vessels.§ This plan, however, has been adopted with success in Germany,|| and even Mr. Hey assures us, that, in one of his cases, he found great advantage from having applied some tape round the sound part, as he was thereby not only enabled to divide the integuments more easily and correctly, but was furnished with a useful kind of tourniquet, which kept the divided vessels from bleeding, till he was prepared to take them up with the tenaculum and ligature.¶

Were a case to present itself, in which the mouths of the arteries could not be found and taken up, the practitioner would be compelled to resort to means, which experience proves to have occasionally succeeded under similar circumstances; as, for instance, compression,\*\* with agaric, sponge, or lint dipped in powder of gum arabic; ice-cold water,†† and the actual cautery,‡‡ a circular band, strip of plaster, or tourniquet, &c. The uncertainty of all these methods, however, is generally acknowledged.§§

In order to prevent a closure of the urethra, as well as to enable the patient to make water easily, and keep the urine from

\* Schmalz in Loder's Journ. 1 b. s. 622.

† See Schreger's Chirurgische Versuche, b. i. p. 243.

‡ See NOTE I.

§ See Schreger's Chirurgische Versuche, b. i. p. 247.

|| Ollenroths, in Hufeland's Journ. 3 b. s. 56.

¶ Hey's Practical Observations in Surgery, p. 478, ed. 2.

\*\* Dolignon, Journ. de Médecine, t. lxxxiii.

†† Siebold, Chir. Tagebuch, p. 52.

‡‡ Sabatier, Médecine Opératoire, t. ii. p. 306. Ollenroths, Hufeland's Journal, 3 b.

§§ See NOTE K.

coming into contact with the wound, many surgeons, as soon as the operation is finished, introduce a short silver cannula, or an ordinary catheter, into that canal. If the short cannula be chosen, it must be made with little rings, so that it may be conveniently fastened in its situation. Were the amputation about to be done towards the tubes, a silver catheter should be introduced before the operation, because here the retraction of the parts is such, that the introduction of the instrument afterwards might be found difficult, if not impracticable.

With respect to the introduction of any tube, either before, or directly after the operation, in ordinary cases, surgeons are not unanimous upon the subject. I have seen the operation done very well without it, and the parts favourably healed, a bougie having been passed a little way into the urethra once a day, after the removal of the dressings, to hinder the contraction of the orifice of the urethra. This was Mr. Hey's practice.

A flexible gum catheter is preferable to a metallic tube, since it creates less irritation. The irritation of the wound by the urine, and the necessity of hindering the orifice of the urethra from closing, will probably always lead many practitioners to pass a silver or elastic gum catheter. The instrument, however, should be large, for otherwise, the urine getting out between it and the urethra, and wetting the dressings, irritates and frets the wound. Le Dran mentions a case, in which, from the neglect to pass a catheter, the orifice of the urethra became impervious, so that the urine could not be discharged.\* Bertrandi cites another case from the writings of Nannoni, where it became requisite to enlarge the orifice of the urethra by an incision, the surgeon not having taken the proper precautions soon enough after the operation, to hinder the closure of the opening. Desault also records an example in which it was necessary to use caustic for the same purpose. If the operator should determine not to use such an instrument, he must at all events not save skin, as, when it is brought forward, it obstructs the flow of urine.

\* Operations in Surgery, p. 158, ed. 2.

## CHAPTER XLIX.

## STRICTURES OF THE URETHRA.

A STRICTURE of the urethra may be defined to be a preternatural diminution of the diameter of a part of that canal. By the late Mr. Hunter, strictures of the urethra were divided into three kinds; first, the true permanent stricture, arising from an alteration in the structure of the passage; secondly, a mixed case, composed of a permanent stricture and spasm; and thirdly, the true spasmodic stricture.\* This mode of taking up the subject, supposes the urethra to possess a natural power of contraction and relaxation, a circumstance which, though possibly true, and most commonly believed in this country, is not universally admitted; and abroad, especially in France, can be said to have very few advocates. It may be difficult, and perhaps impossible, (says Sir Everard Home,) to prove this membrane to be muscular, either from its appearance or from examination of its texture, since the peculiar structure, upon which the contraction of a muscle depends, has not as yet been ascertained. Other structures, apparently membranous, and equally unlike the fasciculated fibrous texture commonly met with in muscles, are endowed with a power of contracting and relaxing in a much greater degree, than is ever found to take place in the membrane of the urethra. The *tænia hydatigenia ovalis*, an animal consisting of a semi-transparent membranous bag, met with in the brain, liver, and omentum of sheep, when taken from its natural situation, and kept in tepid water, contracts and relaxes the different parts of its bag to a considerable extent.† The muscular structure of the ureters cannot be demonstrated; yet no one doubts, that they possess a contractile power. Their function of conveying the secreted urine from the kidney to the bladder, requires the exercise of tonic powers; and the idea of this fluid finding its way by the force of gravity, is not only repugnant to the laws of the animal economy, but is irreconcilable with obvious phenomena. The adhesion of the sides of the tube, where it penetrates the coats of the bladder, presents an

\* See a Treatise on the Venereal Disease, p. 111, ed. 2.

† See Practical Obs. on the Treatment of Strictures, &c. by Sir E. Home, p. 15. His subsequent observations, tending to prove the existence of longitudinal fibres on the outside of the lining of the passage, are noticed in my Surgical Dictionary.

obstacle, which can be overcome only by the exertion of some force; and this obstacle is vastly increased in the distended state of the bladder, during which the fluid is constantly finding its way into this receptacle.\*

In the same manner, although the muscular structure of the urethra cannot be demonstrated, many phenomena are in favour of the affirmative, and, at all events, leave no doubt of the canal possessing a power of altering its diameter. Here the functions of the part, and certain facts remarked in practice, afford a better criterion than anatomy, which, it is allowed, does not in this instance give us any kind of evidence; or what it is said to demonstrate upon this point, by no means tends to confirm the opinion of the urethra being a muscular as well as a membranous tube. I here allude more particularly to the ingenious observations of Mr. Shaw, who has discovered, that there is in the membranous part of the urethra a vascular structure resembling the corpus spongiosum, and capable of injection. This anatomical fact, he conceives, may be taken to disprove the existence of muscular fibres in any part of the urethra, since what has been described as muscular fibres immediately under the mucous membrane, is the uninjected vascular texture of the internal spongy body,† the term applied to this newly remarked structure. Yet, there are various circumstances, which forbid us from coming to the decision, that the membrane itself of the urethra cannot be muscular. When the urine passes out, the canal is large; when the semen is thrown out, it is small. When a portion of its membrane is in an inflamed state from gonorrhœa, its surface is more readily stimulated, and the irritation of the urine makes it contract so much, that frequently the fluid is voided only by drops. In this state, if the penis be immersed in warm water, the urethra often becomes suddenly relaxed again, and the urine is more easily discharged. In many cases, the surgeon finds, when he attempts to introduce stimulating injections into the urethra, that they will not pass towards the bladder, but are rejected again with considerable velocity.

Sommerring refers the formation of strictures to a thickening of the diseased part, and does not appear to entertain any belief in the spasmodic nature of these cases.‡ The same opinion is professed by several modern French surgeons.§ Mr. C. Bell

\* Rees's Cyclopædia, art. Kidney.

† See Medico-Chirurgical Trans. vol. x. p. 353, &c. 8vo. Lond. 1819.

‡ Sömmerring, Abhandlung über die schnell und langsam tödtlichen Krankheiten der Harnblase und Harnröhre bey Männern im hohen Alter. Frankf. 1809.

§ Delpech, Précis Elémentaire des Maladies, réputées Chirurgicales,



believes, that the white condensed substance, which constitutes the most common kind of stricture, must be equally incapable of yielding to pressure and spasmodic action. He observes, that this fact of the firm nature of a stricture, pointed out by Mr. Hunter, is a sufficient proof, that a stricture cannot be spasmodic; and that even if the diseased part of the urethra were originally muscular and contractile, the condensation and callosity of the part must be attended with loss of such contractile power.

According to Mr. C. Bell, it is by confounding the effect of the proper muscles of the urethra, that the canal has been imagined to possess a muscular property. "I made (says he) the following simple experiment, in order to put this to the test. I got a small ivory ball, to which I attached a thread. I introduced the ball into the urethra. I made the man endeavour all he could to push it out, but he could not; neither was it retained in the slightest degree, when pulled by the thread. I thought it might be more satisfactory, if I imbued the ball with something stimulating. I tried coarse soap and spirits; but still there was no power in the urethra to retain the ball, or to push it forth. This could be done only by the urine behind it, and the operation of the bladder, or the ejaculator seminis. I need not add, that this experiment was made upon a part of the urethra anterior to the seat of the ejaculator seminis. In the course of practice, I find, that when the silver ball is introduced down to the ejaculator seminis, it is resisted by that muscle, especially when the parts are irritable. I find it sometimes thrown out of the grasp of the muscle; but when pushed fairly into the sinus of the urethra, which is into the middle of the muscle, the ball is allowed to remain."\* The same person endeavoured to ascertain whether the urethra had any action on fluids. He employed a glass tube to throw an injection into the urethra, the end of the tube being constructed for passing into the orifice of the passage. Pressure was made on the urethra five inches down. By elevating the tube or column, the fluid distended the urethra; but no irregularity in the height of the fluid in the tube indicated any muscular power of the urethra to discharge its contents. When the urethra was distended, the slightest touch upon it with the finger elevated the fluid in the tube; but no effort of the patient produced the effect. When he made the effort, it was with the ejaculator seminis, behind the part of the urethra compressed by the fingers.†

t. i. pp. 554-556. 8vo. Paris, 1816. Richerand, *Nosographie Chir.* t. iii. p. 487, &c. edit. 4.

\* Letters concerning Diseases of the Urethra, p. 95. 8vo. Lond. 1810.

† Ibid. p. 96. 8vo. Lond. 1810.

The conclusion, drawn by Mr. Bell, is, that the part of the canal, anterior to the muscles which surround it, has no muscular power.

Mr. Bell thinks, that we can be at no loss to account for spasm in the posterior part of the urethra, since five inches of the canal in that situation are surrounded by muscles; the accelerator urinæ, or ejaculator seminis; the sphincter vesicæ, the compressor prostatae, and the levator ani. And, he adds, that it must never be forgotten, that it is the sensibility of the urethra which governs their contraction.

The action of the muscles in the perinæum, as an explanation of some of the phenomena remarked in cases of stricture, has been too much overlooked, and there can be no doubt that they in some degree have the effect, which the foregoing writer imputes to them; but, possibly, the membrane of the urethra may yet be itself endued with a muscular, or, at all events, a contractile power.

Mr. Shaw, who adopts similar views of this question to those entertained by Mr. C. Bell, reinforces the arguments of the latter, not only by additional reflections, deduced from a consideration of the action of the muscles in the perinæum, as an explanation of some circumstances usually imputed to spasm of the urethra itself, but by referring a great deal to the natural elasticity of its membrane,\* and adducing a mode of reasoning commonly employed by the French† and German surgeons, in their account of the formation of strictures. Thus, when a circumstance in this disease cannot be explained by the action of the ejaculator seminis and other muscles in the perinæum, it is ascribed either to elasticity of the passage, or to a transient increased determination of blood into the corpus spongiosum, producing a temporary augmented diminution in the calibre of the urethra, and a fallacious appearance of spasm in that canal.‡

However curious and interesting this question may be in an anatomical or physiological light, it is less important in a surgical point of view than may at first be imagined, since the

\* "The injection was expelled by the elasticity of the parts." *Medico-Chir. Trans.* vol. x. p. 346. The final expulsion of a bougie is referred to the same cause. *Ib.*

† "N'a-t-on pas pris les commencemens de la coarctation aggravée par les augmentations passagères de l'engorgement des parois du canal, pour le spasme dont il s'agit. *Delpech, Précis Élémentaire des Maladies réputées Chirurgicales*, t. i. p. 556. 8vo. Paris, 1816.

‡ Upon this principle, viz. the diminution of the canal by the swelling of the parts, combined with irregular action of the muscles in the perinæum, and of the detrusor urinæ, Mr. Shaw accounts for the stream of urine becoming smaller in gonorrhœa, or being quite stopped, and for the impossibility of throwing a stimulating injection into the bladder. *Medico-Chir. Trans.* vol. x. p. 347.

treatment of strictures should in all probability be conducted on precisely the same principles, whether the spasm, that sometimes has a share in increasing the impediment to the exit of the urine, depend upon the muscularity of the membrane of the urethra itself, or upon the muscles situated near this canal. This, I conceive, must be the case, especially as the action of the muscles in the perinæum is said by Mr. Bell himself to be entirely governed by the sensibility of the passage. I think, however, that the term spasmodic stricture might as well be dropped, and that no case ought to be called a stricture, until there is some permanent contraction, arising from a chronic thickening, or a change of structure, in the diseased part of the urethra. It has never been clear to me, that any material light is thrown upon the mode in which the disease is formed, by imputing so much to spasm as several writers have done; and whether the membrane of the urethra be contractile or not, a permanent stricture could never be formed without some process, by which the part is thickened, as well as constricted. According to Mr. Hunter, the disease generally occupies no great length of the passage; and in most of the cases which he had seen, it extended no further than if the part had been surrounded with a piece of packthread. Indeed, in many of the examples, the stricture is said to have presented a great deal of that appearance. Mr. Hunter adds, however, that he had seen the urethra contracted for more than an inch in length, owing to its coats, or internal membrane, being irregularly thickened, and forming a winding canal.\* And Mr. S. Sharp, in speaking of strictures, informs us, that they happen sometimes to a small portion of the passage only; at other times, *to a very considerable length of it*; and, frequently, to three or four different parts of it.† Sometimes, also, two strictures form within an inch of each other, and the space between them is narrower than the rest of the canal.

A stricture, says Mr. Hunter, does not arise, in all cases, from an equal contraction of the whole circumference of the urethra; but, in some, from a contraction of one side. Sir E. Home has met with cases where there were three strictures, and all on the same side of the urethra, the other being perfectly smooth. This form of the disease throws the passage to the opposite side, and often renders the introduction of the bougie difficult. The contracted part is described by Mr. Hunter as being whiter and harder, than any other part of the urethra. Sometimes there are more strictures than one: Mr. Hunter met with half a dozen in one urethra, some of which

\* Treatise on the Venereal Disease, p. 113.

† See Critical Inquiry into the present State of Surgery, p. 145, ed. 4.

were more contracted than others. Indeed, says he, many urethræ, in which there is a stricture, have small tightnesses in other parts of them.

#### DIAMETER OF DIFFERENT PARTS OF THE URETHRA.

The urethra naturally is not of the same diameter throughout its whole extent; and some parts of it are much more liable to stricture than others. In order to determine with precision the length as well as width of the urethra, Sir E. Home took exact casts of it in wax. The subjects from which they were taken, were of different ages; one was between 70 and 80; the other 30. The length of the canal corresponded exactly in both casts. From the external orifice to the neck of the bladder was 9 inches; but, in a note, this gentleman observes, that in a relaxed state, the canal is commonly about  $8\frac{1}{2}$  inches in length. From the external orifice to the bulb of the urethra was 7 inches. The membranous part, extending from the bulb to the prostate gland,  $1\frac{1}{4}$  inch; and the canal passing over the prostate gland was half an inch in length.

The following were the diameters of the casts of the urethra in different parts:—

	Years old	80	30
At $\frac{3}{4}$ of an inch from the external orifice	-	$\frac{9}{20}$	$\frac{7}{20} \frac{1}{2}$
At $4\frac{1}{2}$ inches from the external orifice	-	$\frac{7}{20}$	$\frac{7}{20}$
At the bulb, 7 inches from the orifice	-	$\frac{12}{20}$	$\frac{13}{20}$
In the membranous part directly beyond the bulb,			
$7\frac{1}{2}$ inches from the orifice	-	$\frac{7}{20}$	$\frac{4}{20}$
In the membranous portion near to the prostate			
gland, $8\frac{1}{4}$ inches from the orifice	-	$\frac{9}{20}$	$\frac{7}{20}$
Where the membranous part terminates, and the			
prostate gland begins, $8\frac{1}{2}$ inches from the orifice	-	$\frac{11}{20}$	$\frac{10}{20}$
At the neck of the bladder, 9 inches from the orifice	-	$\frac{9}{20}$	$\frac{8}{20}$

These dimensions, it is to be understood, are much beyond those of the easy state of the urethra.

#### MOST FREQUENT SITUATION OF STRICTURES.

The two parts of the urethra, which are naturally the most narrow, are found also to be those most liable to stricture. In fact, strictures occur most commonly just behind the bulb of the urethra, the distance from the external orifice being  $6\frac{1}{2}$  or 7 inches. The situation, next in order of frequency, is about  $4\frac{1}{2}$  inches from the orifice of the glans. Strictures do also form at  $3\frac{1}{2}$  inches from this orifice, and sometimes almost close to it. Mr. Hunter never met with a stricture in that part of the urethra which passes through the prostate gland. In some cases, the external orifice itself is contracted.

In almost all the cases, which Sir Everard Home has attend-



ed, there was one stricture, about seven inches from the external orifice, whether there were others, or not.

#### SYMPTOMS OF STRICTURE.

It is noticed by Mr. Hunter, that most of the obstructions to the passage of the urine, if not all, are attended with nearly the same symptoms. Few patients notice the symptoms of a stricture, till they have either become violent, or have been the cause of other inconveniences. For instance, a patient may have a considerable stricture, without observing that he does not make water freely; he may even have a tendency to inflammation and suppuration in the perinæum, and not feel any obstruction to the passage of his urine, nor suspect that he has any other complaint, than the inflammation in the perinæum. The stream of water becomes small, in proportion to the obstruction; but this symptom, though probably the first, is not always noticed by the patient. In some instances, the urine is voided only by drops, and then the disorder cannot escape notice; in others, the stream is forked, or scattered.\* Although, as Sir E. Home observes, the first progress of the contraction is in general very slow, yet, when once it has so far increased, that the urethra is not wholly relaxed by the force of the urine, its subsequent advances are more rapid, and new symptoms are perceived. The urine is voided more frequently; does not pass without a considerable effort, attended with pain, and a straining continues after the bladder is emptied. If the patient accidentally catch cold, drink a glass of spirituous liquor, acid beverage, or punch, commit an excess in drinking wine, or remove quickly from a warm to a cold climate, the urine will pass only by drops, or be entirely obstructed; these causes inducing in the contracted part, or adjacent muscles, a spasmodic action, by which it is closed. Cold, externally applied to the body, (continues Sir E. Home,) has so great an effect upon a spasmodic stricture, or, as others would say, a stricture liable to be increased by spasms of the muscles in the perinæum, that a patient, who can make water without the smallest difficulty in a warm room, upon attempting it in the open air, shall be entirely unable to void a drop; but, even in this difficulty, if he return to a warm room, and sit down some little time, the urine will come away. The symptoms of stricture come on more frequently when the patient is leading a sedentary, than an active life.

From the long continuance of strictures, the bladder becomes contracted. This is sometimes, as a late writer observes, merely a temporary affection; but, in other instances, it depends upon

\* Hunter on the Venereal Disease, p. 112.

a changed organization of the bladder, and is then generally a disease for life. The muscular bands of the organ are enlarged, and its whole substance surprisingly thickened. In these cases, the urethra behind the stricture, and the ureters, instead of being contracted like the bladder, are often greatly expanded.\*

Permanent strictures are generally attended with a discharge of matter, or a gleet. This is often considered by the patient as the whole disease; and sometimes it is not till after the surgeon has long tried in vain every means that he can imagine, to effect a cure, that other symptoms are noticed, and a stricture is at last suspected. In diseases of the urethra, and also in those of the prostate gland and bladder, there is generally an uneasiness about the perinæum, anus, and lower part of the abdomen.

Intercourse with women generally renders strictures worse, the passage being left by it in an extremely tender state. The discharge of urine causes a great deal of irritation, and, in a few hours, a running of matter commences. In certain instances, the contraction is so great, that it stops the emission of the semen altogether, and forces it back into the bladder; while, in some other cases, this fluid passes through the stricture after the orgasm has taken place, but with little or no force.

There is one circumstance, which has a great tendency to make a stricture be mistaken for a gonorrhœa; viz. the pain in making water is confined to the same spot in both diseases. A stricture in the membranous part of the urethra does not render the part itself particularly sensible; but all the painful sensations are felt about an inch and a half from the orifice of the glans penis. This is a general fact, and unaccountable as it may seem, it is not more extraordinary, than the burning pain felt in the glans, in cases of stone, even when the whole of the urethra is perfectly sound.

When a stricture is in an advanced stage, the diseased part is at all times much narrower, than the rest of the canal. According to Sir E. Home, however, the stricture still retains a power of contracting and relaxing itself: in the contracted state, closing up the passage; in the relaxed state, allowing the urine to pass through it in a small stream.

The spasmodic contraction is indicated by the urine not passing in a stream; and by the extreme difficulty of now introducing a small bougie, which, in the relaxed state of the canal, met with no resistance. The bougie also, if allowed to remain a few minutes, is not unfrequently grasped so tight by the spasmodic contraction, that it cannot easily be withdrawn. When

\* See a Treatise on Stricture of the Urethra, by James Arnott, p. 139. 8vo. Lond. 1819.

examined, it has an appearance exactly resembling what would have been produced, if a piece of packthread had been tied round it. In this stage, the spasmodic contractions, although more violent, occur less frequently, than while the stricture was in a more recent state. When the stricture has been of some years standing, the coats of the bladder become thickened; in which state, it does not admit of the usual dilatation, so that the patient is obliged to make water with great frequency.\*

I have further to enumerate, amongst the effects of strictures, nocturnal emissions; and, in irritable patients, a variety of unusual sensations about the membranous part of the urethra, conveying to the mind the idea of something crawling or fluttering. In many cases there is a periodical discharge, brought on by cold or other occasional causes. When this happens, the inflammation extends to the bladder; the frequency of making water is much increased; and the urine very turbid. Sometimes the bladder inflames more violently, and secretes purulent matter, which passes out after the urine. In still worse attacks, the discharge from this viscus is glairy, like the white of an egg, and of a strongly tenacious consistence.

Attacks of the preceding kind may bring on peritonitis, and the patient be carried off. Sometimes also the incessant irritation of the strictured part, by the efforts to make water, brings on a gradual diminution of the canal, and, in a few instances, a total obliteration of a portion of it. This last event cannot happen without destroying the patient, unless another outlet be formed for the urine. Complete strictures, therefore, are only met with when fistulæ in perinæo have been produced.

Some patients are liable to complete paroxysms of fever; that is to say, often have a cold, hot, and sweating stage of febrile disorder, in regular succession.

Strictures may give rise to a swelling of the testicle; and their irritation not unfrequently brings on hemorrhoids. Sometimes they occasion strangury and retention of urine. If a patient goes suddenly from a warm into a cold situation; if he drinks too freely of wine; eats high-seasoned dishes; catches cold; commits any species of intemperance, or delays making water too long, after feeling the inclination, he exposes himself to the danger of these latter grievances.

The affections, most liable to be mistaken for stricture, are spasm of the muscles surrounding the urethra; common inflammation of the passage; gonorrhœa; tumour, inflammation, or abscess in the neighbouring parts pressing upon the urethra; swelling of the lacunæ of the urethra; stone in this canal, or the bladder; and diseased prostate. In cases of stricture, the increase

\* See Home's Practical Obs. on Strictures.

of the gleet discharge and pain, after coition, comes on suddenly after the cause, and, if left to itself, will generally decline in about a week. On the other hand, in gonorrhœa, a few days usually intervene between the exposure to infection, and the beginning of the symptoms, which then gradually increase to their acme; and only begin to subside as late as ten days after their commencement. In gonorrhœa also, the pain in making water is more severe.\*

Obstructions from calculi in the urethra may be known by the preceding symptoms of gravel; by the collision of a sound against them; by the sudden sharp pricking pain which they excite; and often by their being obvious to the touch.

In cases of stone, the difference from stricture is proved by the stream of urine being generally full, and sometimes suddenly stopped; by the patient being able to make water more easily in some positions of the body, than in others; by there being no obstruction to the passage of instruments into the bladder; and by the possibility of touching the stone with a sound. A diseased prostate gland is to be suspected, especially in elderly persons, when a bougie will pass seven inches and a half without obstruction, but not into the bladder. The reason of this circumstance depends upon the fact of strictures being rarely more backward, than the beginning of the membranous part of the urethra. The swelling of the gland may also be felt within the rectum, and an elastic catheter can generally be got into the bladder.

#### CAUSES OF STRICTURES.

The origin of the disease is often imputed to the effects of gonorrhœa, or to the method of curing it. Mr. Hunter specifies various reasons against this doctrine. Strictures are common to most passages in the human body: they often occur in the œsophagus; in the intestines, especially the rectum; in the anus; in the prepuce, producing phimosis; and in the lachrymal duct; without any previous disease. They sometimes happen in the urethra itself, without ever having been preceded by gonorrhœa.† Mr. Hunter saw an instance of this kind in a young man of nineteen, who had a stricture for eight years, and which therefore must have begun when he was only eleven years of age. He met with a stricture in a boy only four years of age, and a fistula in perinæo in consequence of it. He thought strictures as common in persons who had had gonorrhœa slightly, as in those who had had it violently. They never

\* See Arnott on Strictures, p. 49.

† Arnott on Strictures, pp. 52, 53; also, Macilwain on Strictures of the Urethra, p. 55.



come on during the inflammation of a clap, nor for some time after the infection is gone. Thirty and forty years sometimes elapse, between the cure of a gonorrhœa, and the beginning of a stricture. If strictures arose in consequence of the inflammation accompanying this disorder, we should expect to find them of some extent, because the inflammation is itself of some extent; and we should also expect to find them most frequent in that part of the urethra which is usually the seat of gonorrhœa. But, they are not so frequent there as in other parts of the canal. Notwithstanding these arguments, the generality of surgeons still regard gonorrhœa as a frequent cause of strictures.

Strictures are often supposed to arise from the use of injections in gonorrhœa; but Mr. Hunter saw as many strictures after gonorrhœas, which had been cured without injections, as after other cases, which had been cured with them. Such modes of accounting for strictures, he observes, give no explanation of cases which have not been preceded by gonorrhœa, or the use of injections.

The stone is sometimes a cause of stricture, and this occasionally happens in infancy. Sir E. Home has met with such cases in children only six years of age, and from other examples, which he has recorded, it would appear, that the disease is frequent in calculous patients of more advanced years.

In the East Indies, and other warm climates, strictures are much more readily brought on, than in Europe; and it is thought, that the excesses in which the inhabitants of hot countries indulge, have great effect in promoting the formation of the disorder.

Strictures have arisen from the application of external violence to the perinæum; from the irritation of the membrane of the urethra by blisters; and from the irritation of a diseased prostate gland. Cases, in proof of these observations, may be perused in Sir E. Home's publication.

#### TREATMENT OF STRICTURES.

The first object is to ascertain the precise situation of the stricture nearest the orifice of the urethra. For this purpose, a common bougie, proportioned to the size of the aperture of this canal, is to be gently introduced. If it readily enter the passage, the surgeon may be well assured, that its size is not too large, and that no impediment to its further introduction, can proceed from this circumstance; for, the mouth of the urethra is naturally one of its most narrow parts. Small bougies, and such as are too much pointed, are apt to be stopped by the lacunæ, or orifices of the mucous glands, and to deceive inexperienced surgeons.

The surgeon should take hold of the penis, by placing the

forefinger and thumb of his left hand on each side of the prepuce, opposite the corona glandis, so as to avoid making any pressure on the passage. The instrument having been oiled, is to be held like a pen, and introduced a little way at first; then the surgeon is to draw the penis forward, as it were, over it, with the index and thumb of his left hand, while he gently persists in pushing it further into the passage with his right hand. As it enters the urethra, it ought to be artfully rotated, first in one direction, and then in the other, in order that its extremity may not be entangled in any fold of the membranous lining of the passage. The situation of the stricture nearest the mouth of the urethra having been ascertained, the next desideratum is to learn, whether the contraction is such as would be produced by tying a piece of packthread round the canal; whether, on the other hand, it occupies a considerable extent of the passage; and lastly, what is the size of the bougie that can be introduced through it.

A knowledge of the extent of the stricture, if it could be obtained, would be of essential use in the treatment; because, I presume, when the obstruction extends far along the urethra, no surgeon would ever prefer caustic bougies. Those armed with the nitrate of silver, could never be expected to burn their way through a stricture an inch in length; and if other bougies, armed with the caustic potassa, are conceived to admit of being applied to such a stricture with any degree of precision, or any other real efficacy, than what actually arises from their mechanical action, when passed through the stricture, I confess, that it is more than my own observations authorize me to believe. In all cases of this description, as well as in others, in which two strictures are near together, and the intervening part of the canal much contracted, caustic bougies ought not to be used.

Having ascertained, that a common-sized bougie will not pass beyond a particular point of the urethra, the surgeon is to make an impression on the instrument with his nail, close to the mouth of the urethra. Then it should be withdrawn, and one of a smaller size taken, which he is to mark with his nail, exactly at the place corresponding to that of the impression on the first bougie. This smaller one is to be introduced so far as to bring its marked part exactly to the orifice of the urethra, at which period it is clear, that the extremity of the bougie has just arrived at the contraction, which would not allow the first common-sized bougie to pass. If the second bougie cannot be introduced further than the first, a still smaller one is to be tried; but the surgeon should not have recourse to the smallest bougies at once, as the largest, which can be insinuated through the stricture, ought to be the model of the soft white one, which should now be introduced for the purpose of showing the shape

and extent of the stricture, by the impressions made upon it. If, after the soft bougie has remained a minute or two in the stricture, it should be marked with a distinct circular, or semi-circular narrow furrow, on being withdrawn, probably the stricture does not occupy much of the urethra.

It is somewhat difficult to ascertain, by means of bougies, whether the diameter of the urethra is diminished behind the most contracted part of the stricture. Mr. C. Bell uses a particular sort of probe for ascertaining the extent of the disease. "I procured (says he) a series of silver and gold probes,\* with circular knobs; the knobs varying from the full size of the urethra to what will just pass the narrowest stricture. By successively introducing smaller balls, I ascertain the degree of stricture by the ball which passes easily, and I am secure of being in the passage, by passing the probe onward, when it has got beyond the stricture. Then by the slight feeling of resistance in passing the ball, and in withdrawing it again through the obstruction, I ascertain the extent of the contraction. If the ball of this probe be liable, like the point of the bougie, to enter one of the lacunæ, or on passing it to rub upon its edge, yet by feeling whether the same roughness or difficulty attends the withdrawing of the bulb of the probe, as when it passed downward, we may be assured, whether there be a stricture of the canal, or whether the obstruction be not caused merely by the lacuna."† As the lacuna opens towards the urethra, its edge cannot catch the probe, whilst this instrument is being withdrawn, at which period an uniform smoothness must be felt, unless there be disease. When there is an irregular hardening of the urethra for a considerable extent, the probe moves along it with difficulty; but, no sooner has it passed the obstruction, than it moves on with freedom.

Likely as these ball-probes at first seem to be to afford desirable information, respecting the species of stricture, they are not much used. In fact, they do not answer; and it is the contractile power of the urethra, or (if others will not allow it) it is the action of the muscles contiguous to this passage, which sometimes stops the easy introduction of the probe even when there is no permanent stricture whatever, and which makes it more difficult to ascertain the nature and extent of the obstruction, than would otherwise be the case.

#### METHOD OF USING THE COMMON BOUGIE.

This instrument acts by producing a mechanical dilatation of the stricture.‡ However, as it operates on living matter, it

\* See Plate 12, figs. 1 and 2.

† System of Operative Surgery, vol. i. p. 104.

‡ {The benefit derived from bougies appears, Mr. Abernethy thinks, to

either makes the dilated part adapt itself to its new position, or recede by ulceration. If the case is one, that will allow even the smallest bougie to be introduced through the stricture, the cure may be considered as in our power. In many cases, in which the stricture is considerable, a great deal of trouble is given by spasms, which either prevent the introduction of bougies altogether, or only allow a very small one to pass. In such cases, Mr. Hunter sometimes made the bougie pass, by rubbing the perinæum with one hand, while he pushed forward the bougie with the other. He also frequently succeeded, by letting the bougie remain close to the stricture, a little while, and then pushing it forward. The spasm (whether of the muscles in the perinæum, or of the membrane of the urethra itself, is a matter of no great practical importance) has sometimes been removed by dipping the penis in cold water.

It is sometimes difficult to ascertain, whether a small bougie has passed through a stricture, or has only bent. In this case, a common-sized bougie should be previously introduced, to learn the situation of the stricture, and afterwards, when the end of the small bougie is known to have reached the obstruction, the surgeon should push the instrument forward very gently, and for a short time. If the bougie enter further, he may know whether it has entered the stricture, by removing the pressure from the bougie; for if this recoil, it has not passed, but only bent. However, a very small bougie may bend, and yet not recoil.

After the bougie has passed a little way through the stricture, and remained there a short time, we should withdraw it, and examine its extremity. If this be flattened, grooved, or have its waxen coat pushed up for some extent, or if a circular impression be made on it by the stricture, or a dent only on one side, we may be sure that it has passed, as far as those appearances and impressions extend.\*

Now it becomes necessary to introduce another exactly of the same size, and to let it remain as long as the patient experiences no particular inconvenience. It is a rule in using the bougie, to avoid as much as possible subjecting the patient to great pain, either from the length of time during which the

“depend on their action as mechanical stimulants. They appear to subdue morbid irritability in the same manner as chemical stimulants.” In the treatment, therefore, he says, “it seems advisable not to do too much at a time; for as irritation and inflammation are the primary causes producing and maintaining strictures, we should avoid all that has a tendency to excite or aggravate these conditions. All excitement occasioned by the first introduction of the bougie should, in my opinion, be suffered to subside before any attempt is again made to pass this instrument.”}

\* Treatise on the Venereal Disease, by J. Hunter, pp. 117-120. edit. 2.



instrument is kept in the canal, or by the size of the bougie being too suddenly increased.

The best time for wearing bougies, is when the patient is in bed in the morning, or when he is not obliged to move about; and this may be done every day, every other day, or every third day, according to the degree of irritation excited. The bougie should be gradually increased in size, in proportion as the stricture dilates, till the largest one can easily pass, and its use should be continued three or four weeks longer, in order to habituate the parts to their new state.

Strictures are very liable to return, and hence, the treatment with common bougies has been accused of inefficacy. I have known some cases, however, in which the cure lasted many years; and others, in which the stricture returned, although caustic bougies had been employed. One reason, why the disease often relapsed in former times, was, because surgeons had no correct notions respecting the natural diameter of the urethra, and, consequently, they never increased the size of the bougie, as far as it ought to have been, in proportion as the disease gave way. On the other hand, in the practice with caustic bougies, surgeons have always given the preference to those of large size; and, if these instruments ever render the cure more durable than common bougies, or flexible catheters, I conceive, that the success is in a great measure ascribable to this circumstance.

One advantage, which common bougies have over those furnished with caustic, consists in their being calculated, when introduced into the bladder, to operate on several strictures at once.

The first introduction of a bougie sometimes produces extreme pain, fainting, shivering, &c.; but, in general, the second and every succeeding repetition of the operation can be borne better, and, at length, the inconvenience is but trivial. Sometimes, however, the irritation of the bougie is such as to compel the surgeon to discontinue its use for a time, and have recourse to antiphlogistic and anodyne remedies.

The slipping of a bougie into the bladder is a serious accident, which may be prevented by tying round its outer end a piece of thread, which is to be carried over the dorsum of the penis, and there gently secured.

#### TREATMENT OF STRICTURES WITH ELASTIC GUM CATHETERS AND BOUGIES.

Perhaps there is no plan of treating strictures in the urethra, which is so mild and unirritating as that with instruments coated with elastic gum. Desault, who had considerable success in the treatment of strictures, rarely employed any means

of cure, except an elastic gum catheter. That this instrument can frequently be introduced through a stricture, even when nothing else will pass, is well known to every practitioner; for, whether he is an advocate for one method of cure, or another, he no sooner fails in his attempts to get through a stricture, than he tries what can be done with a gum catheter. It is quite unnecessary to dwell on the mode of curing strictures with this instrument, or the elastic gum bougie. The cure is effected on the principle of dilatation; the very same principle, on which the common bougie operates. The catheter will sometimes pass without the stilet, when it will not do so with it. This instrument being much less irritating than a common bougie, can be longer worn without inconvenience, especially as the patient can also void his urine without taking it out. Indeed, it may be worn several days together, if judged advisable; but it is generally better to withdraw it sooner, and endeavour to get in another of larger size.

The elastic gum bougie sometimes will not pass a stricture situated about the bulb of the urethra, owing to the elasticity of the instrument keeping its point from ascending over a ridge on the lower side of the canal. On this account, I have found them in some cases not answer, and have been obliged to use either a common bougie, or an elastic catheter containing a wire.

#### METHOD OF USING BOUGIES ARMED WITH THE NITRATE OF SILVER.

A common bougie, of the same size as the armed one, is to be introduced in order to measure exactly the distance of the stricture from the external orifice. This distance, being marked upon the armed bougie, the latter is to be oiled and passed down to the stricture, with which it is to be steadily held in contact, with moderate pressure at first, which is afterwards to be diminished, lest the bougie, when it becomes softened by the warmth of the urethra, should bend. The time which it is to remain depends a good deal on the sensations of the patient, and the length of time the parts have been diseased; but, on the first trial, it should be less than a minute, as it then commonly gives greater pain, than at any subsequent application. Every other day appears, in general, to be as often as it is prudent to apply the caustic. In obstinate cases, however, Sir E. Home has applied it every day, and I have often done the same myself.

The bougie, introduced before the armed one, should be made of soft materials, that it may mould itself to the form of the passage, and communicate information relative to the size and position of the stricture.

In the course of the use of caustic bougies, especially when the patient is guilty of any imprudence, some unpleasant symptoms are liable to arise.

The first is a swelling in the perinæum. It is very apt to be brought on when the surgeon is endeavouring to remove that part of the stricture which is nearest to the sides of the urethra. The swelling, which is of considerable size, is totally different from that which is produced by the long continuance of bougies in the passage, and ends in an abscess. It is entirely caused by blood extravasated in the cellular membrane, and is readily absorbed. The inflammation is also slight, and soon subsides. A second effect of caustic, in some particular cases, is a very profuse hemorrhage. Perhaps, one of the most alarming bleedings that ever took place from the urethra from such a cause, occurred in one of my patients, whose case I have elsewhere related.\*

A third occasional ill-consequence of armed bougies, is strangury. Patients, who are subject to retentions of urine from the use of common bougies, are also not less liable to the complaint, when they are using armed ones, and sometimes they suffer in a still worse degree.

In certain constitutions, the application of caustic brings on ague. This is most common in patients who have passed much of their lives in hot climates; but it happens also in persons who have never been out of England. I once saw in St. Bartholomew's Hospital, an elderly man, who had very bad strictures, for which the caustic was used. After the plan had been followed about a fortnight, a shivering fit came on, directly after the application of the bougie. The method was discontinued for a time, and the man's health rather improved. The caustic was now repeated, and again a violent rigour immediately followed, and the febrile indisposition, which took place, proved fatal in a couple of days.

At present, caustic bougies are much less employed than they were some years ago. In France, however, and upon the continent in general, the practice never gained many partisans. The chief inducement, which rendered the plan a favourite one, depended upon its alleged superiority in radically curing strictures, and leaving no chance of a relapse. I believe that this was only a supposition; for, I have known several returns of stricture after the use of caustic; and, if the disease should recur less frequently, it may be ascribed to the larger size of the armed bougies ordinarily employed. In all probability, common bougies would permanently cure strictures quite as well as any

\* See Edinb. Med. and Surg. Journ. vol. v. p. 333.

armed ones, if care were taken only to increase the size of them, in proportion as the obstruction gives way.

For those strictures, however, which are like what would be produced by tying a piece of packthread round the urethra, perhaps armed bougies generally answer very well. They have also been particularly recommended for irritable strictures, the irritability of which is said to be destroyed with the diseased part of the canal. There are some cases, in which no bougie, nor catheter of the smallest size whatever, can be got through the obstruction. Here the surgeon has the choice of using the armed bougie; of exciting ulceration of the stricture with the pressure of a common one; of forcing a way through the obstruction with a conical silver catheter; or of dividing the stricture with a cutting instrument.

#### BOUGIES ARMED WITH CAUSTIC POTASSA.

Before this caustic is used, the urethra should be rendered sufficiently capacious to admit a bougie, above the smallest size, into the bladder, and the strictures, if very irritable, should have this irritability previously lessened by the use of common bougies.

The bougie is armed with the caustic potassa as follows: put a small quantity of this caustic upon a piece of strong paper, and break it with a hammer into pieces, of about the size of large and small pins' head. Thus broken, it should be kept for use in a phial, closed with a ground stopper.

A proper curvature should be given to the bougie, by drawing it several times between the finger and thumb of the left hand, and it should be just large enough to enter the stricture with some degree of tightness. Then let it be passed gently into the urethra, and when its point stops at the stricture, which it almost always does before it will enter it, make a notch with the finger-nail on the upper portion of the bougie, exactly half an inch from the extremity of the penis. When the bougie is withdrawn, a small hole, about the sixteenth part of an inch deep, should be made at the extremity of its rounded end. Some of the broken caustic should then be put upon a piece of paper, and a bit smaller than the smallest pin's head, is to be selected for the first application. Let this be inserted into the hole of the bougie with a pocket knife, and pushed into it with the blunt end of a pin, so that it may be rather below the margin of the hole. To prevent the caustic from coming out, the hole should then be contracted a little with the finger, and the remaining vacancy in it filled with hog's lard. The bougie, being oiled, is to be passed with the curvature upward, to the anterior part of the stricture, the situation of which has been ascertained beforehand, and the bougie marked as already explained. The



instrument should rest there for a few seconds, until the caustic begins to dissolve. It should then be very gently pushed forward, about one-eighth of an inch, when there should be another stop for a second or two. The bougie should next be carried forward in the same gentle manner, till it has passed through the stricture. After this, it should be immediately withdrawn, by a very gentle motion, to the part at which it was first made to rest a while. Then it should be very slowly passed through the stricture a second time, but without letting the bougie stop in its passage. If pain or faintness arise, the operation is now to end, and the bougie is to be immediately withdrawn; but if no such effects be produced, the instrument may be passed and withdrawn once or twice more.

The application is to be repeated once every seven days, and if the stricture be found dilated, the bougie must be proportionally increased in size every time. In no cases ought the piece of caustic to be larger than a common pin's head.

By the above procedure, Mr. Whately asserts, that the caustic potassa is equally diffused over every part of the strictured surface, and only *abrades* the membrane of the stricture, without producing a slough. The objection to this practice consists in the impossibility of regulating the action of the caustic with the precision supposed, and in the questionable nature of its operation when thus employed. For my own part, I believe, whatever efficacy Mr. Whately's treatment possesses, arises from the mechanical effect of the bougies.

#### FLEXIBLE METALLIC BOUGIES, OR SOUNDS.

For some years past, a plan has prevailed of treating strictures with bougies composed of a soft, flexible metal. They have a highly polished surface, of a silvery hue, and as the diameter of some of them is considerable, they possess a sufficient degree of firmness, both for introduction, and for retaining the curve of the urethra. This last circumstance is considered by some practitioners a great advantage, exclusively belonging to metallic bougies. Hence, as soon as they have received the curvature which is judged to suit the patient best, they are carefully preserved in this form throughout the cure, and are kept in a case which has a corresponding shape. Formerly I have heard of objections to these instruments, on the ground of their being liable to break in the urethra; but although they are now oftener used, such an accident is much less frequent. Perhaps, this is to be imputed partly to their present composition, which is firmer, and less flexible, than it used to be some years ago, and partly to their present greater diameter. Many patients bear the employment of metallic bougies better than any others. It seems only necessary to add,

that they effect a cure on the principle of dilatation, like common bougies.

The curvature of metallic bougies, and catheters, should always correspond to that of the urethra. Mr. Stanley has investigated, with great care, the natural curve of the membranous part of the urethra, where it passes under the arch of the pubes; and he finds, that an instrument, whose curve forms a considerable segment of a circle, one and a half, or two inches in diameter, while the rest of it is straight, is best adapted to the natural course of the passage.\*

#### CONICAL SILVER CATHETER.

It is remarkable, that the French surgeons, who have always objected to armed bougies, which appear to them too violent a means of cure, have set the example of treating strictures on the principle of actual force. Mr. Cross recites a case which he saw in La Charité. A man, who had long had a permanent stricture, had been repeatedly treated for it. Unsuccessful attempts were made, for several days, to pass an instrument into the bladder by gentle means. The patient was still able to void his urine, although with great pain and difficulty. M. Roux took a conical silver catheter, with a very slight curvature, and an extremity almost pointed, and by force, regularly applied, he made his way into the bladder in spite of all opposition. He took care to keep the instrument central, and to judge of the direction of the point by the lateral rings. The rule mentioned by M. Roux, for commencing the great depression of the outer extremity of the instrument, was when, with the finger in the rectum, he could feel that the point had reached the apex of the prostate. He gave great pain to the patient, but succeeded in getting the instrument into the bladder. The urine in the bladder was not suffered to flow out immediately, the catheter being left in the urethra, and its end plugged up with a piece of wood. Three or four days is the time M. Roux commonly keeps the conical catheter in the passage; but, this patient suffered so intolerably, that it was taken out at the end of four-and-twenty hours. An elastic gum catheter, of a small size, was immediately introduced without difficulty; its extremity fastened to the abdomen; and its orifice plugged up, in order that the urine might be allowed to flow only at certain periods. The next day, the patient was comparatively easy. On the fourth day, there was a swelling of the testicle, scrotum, and perinæum. A poultice was applied, and the elastic catheter continued. In four days more, the swelling of the parts had subsided, and the poultice was no longer necessary. A fresh gum catheter, of a

\* See Macilwain on Strictures.

larger size, was introduced. Suffice it here to add, that, in about six weeks, a catheter of the largest size could be introduced.

Another case went on less favourably. The *sonde conique* had been employed, and a gum catheter introduced. But, in less than a week, the patient, believing he could make water without the instrument, took it out himself. The next day, an effusion of urine in the scrotum had taken place, and the fluid was freely let out by two long incisions. The elastic catheter, however, could not be introduced again. The urine now came away in drops from the urethra. The free incisions in the scrotum prevented sloughing; but the patient, who was very weak, and in bad health, died in a few days. It was (observes Mr. Cross) an inveterate case of stricture, and the patient would probably have died under any treatment. Dissection showed a diseased bladder, whose coats were above half an inch in thickness, a cartilaginous stricture, and extensive sinuses communicating with the once membranous part of the urethra.

“The effecting of a speedy cure, in bad cases of stricture,” is the argument advanced by the French surgeons for the use of the conical catheter, where that of elastic gum cannot be introduced without its assistance. They tell us, (says Mr. Cross,) even of bad cases being cured, or greatly relieved, in a month, or six weeks; and certainly in one case, under M. Roux, a catheter of the largest size could be received by the urethra, a month from the introduction of the conical catheter.

From this treatment, M. Roux had never seen any inflammation, or irritation, which was not readily subdued. In his clinical lecture, however, he mentioned two fatal cases which he had witnessed, and examined after death. In one of these, on taking out the silver catheter on the third or fourth day after its introduction, the surgeon could not introduce a gum catheter; in attempting to do which, a false passage had been made. Extravasation of the urine, sloughing, and death, ensued. The second case was somewhat similar: peritoneal inflammation was the immediate cause of its fatal termination, the instrument having passed between the pubes and anterior part of the bladder.

Whoever desires more information, respecting this violent mode of treating strictures, must consult Mr. Cross's publication.\* It is a dangerous plan, which can only be justifiable in the most inveterate and obstinate cases. In such examples, the late John Hunter, Desault, Dease, and others, used the silver catheter with considerable force; and the practice of Mr. Pearson and Sir A. Cooper, is likewise cited, as a sanction of this

\* Sketches of the Medical Schools of Paris, p. 111, &c. 8vo. Lond. 1815.

bold proceeding. The French even sometimes prefer this way of puncturing the bladder, the catheter being forced through the prostate gland; and I have heard of one or two distinguished surgeons in this country, who never perform any of the ordinary methods of puncturing the bladder, but invariably force a catheter into that organ, through the prostate gland.

Another modern writer, who censures the above hazardous mode of forcing a conical sound into the bladder, adopts the practice of cutting down to the stricture, after introducing a silver catheter, and then pierces the obstruction with a trocar. "The stricture (says he) is here the cause of the obstruction: why should it not be opened, and the bladder relieved? since it not only affords a passage to the confined urine, but lays a foundation for a radical cure. This operation, when performed for a stricture of the urethra, (not curable by other means,) and where there is no complication, nor destruction of parts by the extravasation, is perfectly successful. I believe this manner of relieving the bladder would be more followed, if surgeons were aware, by as many proofs as I have before me, that *the membranous part of the urethra is always dilated in stricture.*"\* Here the safest way of operating seems to me to be that described by Mr. Hunter, which will be noticed in the following chapter.

In examples of this description, small instruments have been usually preferred, in order that they may pass when the spasm has yielded; but Mr. Arnott recommends passing down to the stricture a large cannula, with a rounded end, which being pushed against the stricture, opens it, while a small bougie, or catheter within it, is ready to be passed through.†

#### OF THE INSTRUMENT CALLED A DILATOR.

This apparatus consists of a tube of oiled silk, lined with the thin gut of some small animal to make it air-tight, and fixed on the extremity of a small cannula, by which it is distended with air, or water from a bag, or syringe at the outer end, while a stop-cock or valve, serves to keep the air in when received. Though Mr. Arnott finds, that it generally passes down to the stricture as easily as a small bougie, he sometimes prefers introducing it through a smooth cannula, especially when the urethra is irritable. As soon as the bag is sufficiently within the stricture, or strictures, as much air is to be injected into it, as the patient can easily bear. The dilator is said to act with more effect than a bougie, which, as soon as it yields, loses its power of distension, while the force of the dilator is concen-

\* C. Bell. Surgical Obs. vol. ii. p. 56. 8vo. Lond. 1818.

† On Stricture in the Urethra, &c. p. 120.



trated at the stricture, and unceasing.\* In principle, it is exactly like the contrivance used by Bromfield for dilating the female urethra, for the purpose of extracting a calculus; but, for the perfection to which the contrivance has been brought, and for the suggestion of an immense number of circumstances, under which it may prove useful, the profession is indebted to Mr. Arnott, and his brother.

#### OF A NEW PASSAGE.

The greatest evil arising from the improper use of the bougie, and the most dangerous, is the formation of a new or false passage. This is generally occasioned by an attempt to force a firm inflexible instrument, like the conical silver catheter, through the stricture, or to excite ulceration by the pressure of the end of the bougie against the stricture, when an instrument cannot be passed through it. It may also be produced by caustic. After such an evil has once happened, a bougie can rarely be prevented from going into the new passage, so as to be completely hindered from acting on the stricture.

In this circumstance, Mr. Hunter recommends the following operation:—Pass a staff into the urethra, as far as it will go, which will probably be to the bottom of the new passage, and beyond the stricture. Feel for its end, and cut upon it, making the wound about an inch long, if the disease be before the scrotum; and an inch and a half, or more, if in the perinæum. If the new passage be between the urethra and body of the penis, you will most probably get into the sound urethra, before you come to the instrument, or new passage. If so, introduce a probe into the urethra, through the wound, and pass it towards the glans penis, or, in other words, towards the stricture. When it meets with an obstruction, this must be the stricture, which is now to be got through, and afterwards dilated. To complete the operation, withdraw the probe, and, instead of it, introduce a hollow cannula forwards to the stricture. Then introduce another cannula from the glands downwards, till the two tubes are opposite each other, with the stricture between them. An assistant is now to take hold of the urethra on the outside, with his finger and thumb, just where the two cannulæ meet, in order to keep them in their places. Through the upper cannula next introduce a piercing instrument, which is to perforate the stricture, and enter the lower cannula. The piercing instrument is now to be withdrawn, and a bougie introduced through the first cannula and stricture, into the second cannula. The tubes are to be taken out, and the end of the bougie, in the wound, directed into the bladder, through the further portion of the

\* Arnott on Stricture, &c. p. 96.

urethra. It may be necessary to lay the whole of the false passage open, in order to make it heal.

The longer the first bougie is allowed to remain in the canal, the more readily will the second pass, or rather an elastic gum catheter, which, in this case, is a far better instrument.

## CHAPTER L.

### FISTULÆ IN PERINÆO AND EXTRAVASATIONS OF URINE.

WHEN the urethra is very much obstructed, nature often endeavours to procure relief by ulceration on the inside of that part of the urethra, which is within the stricture. The urine then insinuates itself into the loose cellular membrane of the scrotum and penis, and becomes the cause of suppuration, wherever it is diffused, and even of mortification, first, of the cellular substance, and then of several portions of the skin. If the patient survives, the sloughs are detached, leaving a free communication between the urethra and external surface. Every opening, thus produced, is termed a *fistula in perinæo*.

Sometimes the urine finds its way into the corpus spongiosum urethræ, becomes diffused through the whole of this texture, and injected into the glans penis, producing mortification of the parts in which it is lodged. It appears also possible for the urine to pass into the cavernous substance of the penis, instead of into the common cellular membrane. In one example of this kind, recorded by Mr. C. Bell, erections took place from this cause, followed by mortification.\* Even when the urine is contained in the common cellular membrane of the scrotum, the irritation may give rise to suppuration in the corpus cavernosum.† The lodgment of calculi at the stricture, and the increased obstruction thereby produced, sometimes produce ulceration of the urethra, and a dangerous effusion of urine.

In particular instances, the urine does not spread so extensively; but is confined in a sort of pouch, its diffusion being prevented by the adhesive inflammation; and, on other occasions, instead of insinuating itself extensively into the cellular membrane, it is not only circumscribed, but presents itself in a

\* Surgical Observations, vol. i. p. 98.

† Vol. cit. p. 102.

purulent form, having excited inflammation and suppuration in the part. These circumscribed partial effusions of urine are never seen, except in cases where the urethra is either not obstructed at all, or only imperfectly so; for, when the stricture is complete, and no urine whatever can pass, if the urethra ulcerate, the contents of the bladder always flow so suddenly and copiously into the cellular membrane, that the extravasation immediately occupies a considerable extent. It is clear also, that, while no outlet for the urine exists, the effusion must continue to spread, and the mischief to extend.

Abscesses in the perinæum, sometimes communicating with the urethra, and sometimes not, may be brought on by the irritation of bougies; a fact of which all surgeons should be aware.

When the effused urine forms only a circumscribed tumour, an incision may be made into the swelling, and an elastic gum catheter introduced and worn. When the effusion is extensive, and strictures are the cause, a complete cure cannot be accomplished without removing them. But, in general, this indication cannot be fulfilled in time to prevent all the mischief arising from extravasation of urine. An attempt, indeed, should be made to pass a bougie; for, sometimes, the stricture is, more or less, removed by the ulceration. When this is the case, Mr. Hunter advises the almost constant use of bougies, in order to procure a passage into the bladder. However, if it were possible, in this state of things, to introduce a bougie through the whole course of the urethra, the most advantageous plan would be that of keeping an elastic gum catheter continually in the passage; for it would at once conduct the urine outward, hinder any more from being effused, and act, like a bougie, on the remains of the stricture. In cases of this nature, the larger the catheter that can be introduced the better, as it will not only act more quickly on the remains of the stricture, but be more likely to hinder further extravasation.

While measures are taken for curing the stricture, every thing calculated to diminish inflammation, is to be put in practice. Proper incisions for the discharge of the urine, emollient poultices, and fomentations, bleeding, and exposing the parts to the steam of hot water, are especially proper. Opium, given by the mouth, and in clysters, and the employment of the warm bath, are the best means of lessening any spasmodic affection. Too frequently, however, no bougie, nor elastic catheter, can be introduced; the evils arising from the effusion of urine are pressing; and no immediate hopes of overcoming the obstruction can be reasonably entertained.

In these cases, we are advised by Mr. Hunter to empty the bladder, and prevent the further effusion of urine into the cellular substance, by introducing a staff into the urethra as far as

the stricture; cutting down on the extremity of the instrument, and extending the incision a little farther towards the anus, so as to open the urethra beyond the stricture.\*

When the stricture is opposite the scrotum, Mr. Hunter recommends an opening to be made into the urethra in the perinæum; but, here, we cannot have the end of the staff to guide us, and we must trust to our anatomical knowledge. The rest of the operation resembles that for the cure of a false passage. A flexible gum catheter should then be introduced, and the wound healed.

When the total obstruction of the urethra, and the extravasation, depend upon the lodgment of calculi at the stricture, the plain indication is to make an incision down to the extraneous substances, and extract them.

Practitioners, unaccustomed to see the consequences of urinary extravasations, would be alarmed at the magnitude of the ulcer, which is occasionally left after the detachment of the sloughs. Sometimes the whole scrotum, and the integuments of the penis, groins, perinæum, and upper part of the thighs, are attacked with mortification, and the naked testicles are seen in the middle of the enormous sore, suspended by the spermatic cords.† It is hardly conceivable, how cicatrization can take place over the testicles, thus denuded; but the resources of nature are found to be infinite. She causes the testicles and spermatic cords to unite to the subjacent parts, and, by drawing the skin from the circumference towards the centre of the sore, she covers those organs, and forms for them a new investment, like a scrotum. If we except the introduction of the catheter, which is absolutely necessary for a complete cure, and the practice of making timely incisions for the discharge of the effused urine, surgery can afford the majority of patients little or no useful aid; for, when they are not debilitated by the long existence of the disease, are of good constitutions, and in the vigour of life, they recover with as much expedition and certainty under a proper regimen and with simple dressings, as if internal medicines, and a farrago of topical applications, were employed. Desault's practice consisted in applying emollient poultices, until all the sloughs had separated. The ulcer was then dressed with pledgets, or dry lint, which was continued to the end of the treatment. When any complication occurred in the course of the case, an endeavour was made to remove it, by means suited to the indication which it presented. Thus, when there was prostration of strength, bark and cordials were exhi-

\* Treatise on the Venereal Disease, p. 146, edit. 2.

† See Cases illustrating these observations in Mr. C. Bell's Surgical Observations, vol. i. pp. 90-94.



bited. But, in every instance, the elastic gum catheter was the essential means of cure.\*

In old fistulæ in perinæo, where the dangers, arising from the diffusion of urine, are past, the surgeon is to make the natural passage as free as possible, by the use of bougies and catheters; for the fistulous openings often heal up, as soon as the urine finds a ready passage through the urethra. When they do not, they are to be laid open, in the same manner as other sinuses. In doing this, as little as possible of the sound part of the urethra must be opened. Hence, the surgeon must direct himself to the inner orifice of the fistulæ, by means of a staff, introduced, if possible, into the bladder, and a probe passed into one of the fistulous passages. Here it is essential to remark, that however numerous the external openings may be, fistulæ in perinæo never have more than one internal opening, by which they communicate with the urethra, and which is almost invariably on the inferior side of the canal, or that nearest the external surface of the body. The probe should be first bent, in order that it may more readily follow the turns of the fistula. When it can be made to meet the staff, so much the better; for then the operator can cut just what is necessary.

When the fistula will allow a director to be introduced, this is the best instrument. If, as Mr. Hunter observes, neither the probe nor the director can be made to pass as far as the staff, we must open as far as the instrument goes, and then search for the continuation of the passage, for the purpose of opening it.†

After the fistulæ have been divided, as far as their termination in the urethra, a gum catheter should be introduced, and worn; but when the sores become stationary, the catheter should only be kept in the passage occasionally; for its continual presence sometimes prevents cicatrization.

Fistulæ in perinæo, attended with most unyielding strictures, sometimes occur, where it is proper to cut through the obstructed portion of the urethra, and then pass an elastic catheter into the bladder; but, the difficulty of tracing the urethra in the thickened and diseased state of the scrotum, is sometimes very great, such, indeed, as in one or two cases that fell under my notice, completely baffled a professed anatomist. The difficulty is well explained in an example recorded by Mr. C. Bell.‡

The cases published by Sir Astley Cooper,§ and Mr. Earle, exemplifying the possibility of curing, on Taliacotian principles, large fistulous openings, the consequences of the destruc-

\* Œuvres Chir. de Desault, tom. iii. pp. 286, 287.

† See NOTE L.

‡ Surgical Obs. vol. i. p. 128.

§ Surgical Essays, part 2. Phil. Trans. 1821.

tion of large portions of the urethra, by sloughing or ulceration, are truly interesting, and ought to encourage other practitioners not to renounce such cases as hopeless.

## CHAPTER LI.

### RETENTION OF URINE.

WHEN the urine cannot be discharged, the bladder generally becomes distended in an extraordinary degree. In an infant, eighteen months old, it has contained a pint of fluid; and, in adults, six or seven pints. It has been known to occupy, not only the whole cavity of the pelvis, but to ascend into the abdomen, higher than the umbilicus. It has sometimes extended itself even through the abdominal ring, or under the crural arch, into the groin, so as to form an inguinal, or a femoral hernia.\* In ordinary cases, the bladder preserves nearly its natural figure; yielding, however, more from below upwards, than in any other direction. Its lower part becomes broader and more deeply situated, depressing the perinæum; in women, pushing the vagina backward; in men, the rectum; and occasioning in these passages a tumour, which more or less fills up their cavity, and, in the intestine, may actually obstruct the feces. The posterior parietes of the bladder, covered by the peritoneum, push the small intestines upwards and backwards, and rise into the abdominal cavity; while its fundus, in rising above the pubes, glides betwixt the peritoneum and the abdominal muscles. Its anterior superior part, which forms a swelling in the hypogastric region, is actually in contact with the recti and transversales muscles. This circumstance ought to be understood, because it shows how the bladder may here be opened, without the peritoneum being wounded, and an extravasation of urine produced. Not unfrequently, between the fleshy fasciculi of bladders, which have been much distended, pouches, or cells, are observed, containing calculi. When the urine has dilated the bladder to the utmost, without the obstacle to its natural escape through the urethra being removed, it next accumulates in the ureter, which, with the pelvis of the kidney, becomes enormously distended. The valvular contrivance, by

\* See *Récherches sur la Hernie de la Vessie*, par M. Verdier; in *Mém. de l'Acad. de Chir.* tom. ii. 4to.

which the ureter terminates in the bladder, now disappears, and the opening sometimes becomes nearly an inch in diameter. At length, there being actually no room for more urine, the secretion is suppressed.

The symptoms of a retention of urine are of the following kind; either no urine has been discharged for a more or less considerable time; or what comes away is voided by drops, or in inconsiderable quantities at a time. There is a strong and incessant desire to make water, attended with a sensation of weight about the perinæum, tenesmus, constipation, and sometimes hemorrhoids. An acute pain is experienced in the hypogastric region, extending along the urethra to the glans penis, and, after a time, to the kidneys. The pain is increased, when the patient walks, coughs, or holds himself in an upright posture; but diminishes when the body is inclined forward, and the abdominal muscles relaxed. These symptoms are accompanied with fever, and if no relief be afforded, the breathing becomes difficult; copious sweats break out, which have an urinary, or ammoniacal smell; the belly grows tense; and hicough, vomiting, coma, and delirium, indicate the near approach of death. In certain examples, the usual quantity of urine daily dribbles away; and yet the bladder is constantly distended. The symptoms, which more certainly than any others, indicate a retention of urine, are—first, the swellings formed by the distended bladder above the pubes, and in the rectum, or vagina; and secondly, the fluctuation, which is plainly felt, when the tumour above the pubes, and that in the rectum or vagina, are touched together.

The only cases, in which these latter symptoms would be absent, are a few, in which, though a complete retention exists, the unyielding and contracted bladder contains but a few spoonfuls of urine.\*

A retention of urine is an urgent case, and always requires prompt succour. If relief be too long delayed, the consequences are distressing; for the bladder, when long distended, loses its contractile power, which can only be slowly recovered, if recoverable at all; and, what is still worse, if the stoppage of the urine be complete, and remain unrelieved a certain time, the bladder inflames, some point of it sloughs, and a dangerous extravasation of urine follows, generally ending in the patient's death.†

\* *Œuvres Chir. de Desault*, tom. iii. pp. 112–116.

† † Danger is not confined to the effects of inflammation and rupture of the bladder. It occasionally happens in some peculiar constitutions where the symptoms and distress have been extremely urgent, and after the proper measures calculated to allay the inflammation and irritability have been tried without effect, that a sudden relaxation of the whole system ensues

The progress of these cases, when timely relief is not afforded, always varies according to circumstances. 1. When the bladder has been distended in a certain degree, and the cause of the retention is not such as to close the urethra, the contents of the bladder, at length, begin to be discharged by drops; yet, this viscus is not emptied; and though the distention and fulness do not augment, they continue in the same degree as they did previously to the escape of urine from the urethra. It is this sort of retention which may last several weeks, without producing further dangerous consequences. 2. When the disorder is owing to a total closure of the urethra, the distention and fulness of the bladder increase, until at last this organ inflames, a part of it sloughs, the urine is effused, and the patient frequently loses his life. Sometimes, however, and, probably, when the slough is, as it were, only a speck, the bladder bursts at the affected point, the urine becomes diffused in the surrounding parts, and the patient becomes suddenly freed from the preternatural distention of that organ. The result of the case now depends on the situation of the slough in this viscus. For the most part, the breach is formed in the vicinity of the neck of the bladder, so that the urine is extravasated in the cellular membrane of the perinæum and scrotum, and fistulæ in perinæo take place.\* Sometimes the slough opens a passage for the urine into the rectum, and this fluid is suddenly discharged with the stools. The bladder occasionally bursts at its superior and anterior part, and the urine becomes diffused in the cellular substance of the abdominal muscles. When its fundus bursts, its contents may be effused in the cavity of the abdomen, and the consequences be fatal. Sometimes, the urine is discharged at the navel, especially in children, one example of which I have met with myself. In this instance, a preternatural pouch forms, which occasions a fluctuating tumour at the umbilicus, and, at last, the swelling inflames and bursts.

In every retention of urine, two chief indications present themselves: the first is to procure a timely evacuation of that fluid, in order to prevent the serious consequences already specified: the second is, to obviate the causes which hinder its expulsion.

at the end of four or five days. If on this relaxing of the spasmodic action of the urethra, a small sized catheter adapted to the passage of the stricture be tried, it may readily be passed into the bladder, and the urine drawn off, but without the desired relief. The patient, on the passing the catheter, or during the removal of the distention of the bladder, becomes speechless, fainty, and cold, with a cold, profuse perspiration over the whole body, and comatose, and expires in a few hours, without ulceration of the bladder, or the consequent infiltration of urine.}

\* In the urethra, ulceration occurs, as I have described in the chapter on *fistulæ in perinæo*.



## RETENTION OF URINE FROM PARALYSIS OF THE BLADDER.

In this case, the passage for the urine is open; but the bladder has not the power of contraction. The nature of the disorder is distinguished by the foregoing cause, and by the facility with which the catheter can be introduced.

In persons of advanced age, the bladder becomes less sensible to the stimulus of the urine, and loses the power of contracting sufficiently to expel the whole of its contents. This is the first degree of the retention of urine, common to old subjects, and originates in a very gradual manner. The urine flows in a full, but a weak stream, and towards the end of every evacuation, the water only comes away by drops. The quantity of urine expelled at a time, by degrees gets smaller and smaller, until at last a perfect retention occurs.

This species of the disorder is often imputable to a pernicious habit of not taking sufficient time to discharge the whole of the urine. Sometimes, it is owing to an injury done to the loins, and is then usually attended with a paralytic affection of the lower extremities. Most frequently it is produced by an unusual distention of the bladder, whereby this organ is deprived of the power of contracting itself. The distention occurs, either in consequence of retaining the urine too long, after an inclination to void it is felt; or in consequence of another species of retention, which has only attained a certain degree.

The paralytic retention of urine is not so dangerous as the other kinds, especially those produced by a closure of the urethra; inflammation and sloughing of the bladder seldom resulting from it. No sooner is the bladder distended in a certain degree, than the pressure of the abdominal muscles causes a partial discharge of its contents. This case is very liable to be mistaken for an incontinence of urine, partly on account of the urine dribbling away, and the usual quantity being evacuated in the course of the day; partly, in consequence of the patient himself being able by an effort of the abdominal muscles, and pressing the lower part of the belly, to make the urine flow out in a stream.

There are two indications: the first is to draw off the fluid distending the bladder; the second is to restore the natural contractile power of this receptacle; in accomplishing which latter object, it is necessary to pay particular attention to the cause of the disease.

The catheter serves to draw off the water, and its introduction should never be delayed; for the distention of the bladder, and the loss of its contractile power, are continually increasing, and, of course, a radical cure is thereby rendered more and more difficult.

When the contractile power of this viscus is totally lost, the whole of the urine cannot be discharged even through the catheter, more especially when the patient is lying upon his back. In this case, the evacuation must be promoted by pressure on the lower part of the abdomen, and change of posture.

The second indication is to restore the contractile power of the bladder; for, as long as this faculty remains unrecovered, the distention and fulness are sure to recur. Hence, an accumulation of urine must be prevented by the employment of the catheter, which should be introduced several times in the course of twenty-four hours. When the patient, on account of his remoteness, cannot be visited repeatedly, it is better to keep an elastic gum catheter in the urethra.

When the catheter is left in the passage, the urine should not be allowed continually to dribble away through it. Desault found, that the bladder was longer in recovering its tone, when constantly relaxed, than when it was allowed to be sometimes flaccid, and sometimes moderately filled with urine. Hence, either the opening of the catheter may be stopped, and the urine drawn off every two or three hours, or the tube taken out altogether, and introduced merely when the urine is to be discharged.\* If the instrument is to remain any length of time in the passage, it must be withdrawn, and cleaned, every six or eight days.

Together with the use of the catheter, means, calculated to restore the contractile power of the bladder, ought to be employed, as the tincture of cantharides internally, blisters on the sacrum, cold bathing, &c.

When the loins are injured, topical bleeding, cold lotions to the part, ammoniacal liniments, blisters, and electricity, may be tried. Retention of urine is often merely a symptom of another disease, the removal of which is the main object.

When the bladder can completely empty itself, the catheter is no longer necessary; but the surgeon must assure himself by an introduction of the instrument, that this is really the case; for, if any of the urine remain undischarged after each evacuation, the quantity will gradually increase, and a complete retention take place again.

#### CATHETER.

Some of these are inflexible, being generally composed of silver; while others are both flexible and elastic. The com-

\* {Mr. Hey, after making experiments upon this point, came to the conclusion, that it was better to draw off the urine, by introducing the catheter, night and morning.}

mon inflexible catheter is a silver tube, the diameter of which will not prevent its being introduced with facility into the urethra. Its shape and length vary, according as it is intended for the male, or female subject. A common male catheter is ten or eleven inches long. In general, when the urethra is free from obstruction, a large catheter, like a large bougie, will enter the bladder with more ease than a smaller one, because less likely to be entangled in the lacunæ. One-third of the catheter, towards its point, should be moderately bent, the curvature being the segment of a circle about six inches in diameter; the other two-thirds, towards its handle, should be straight. The instrument, when gently curved, is found to be more easily introduced, than when it is very much bent. As I have already noticed, however, the natural curve of the membranous part of the urethra, according to Mr. Stanley's observations, would require a considerable segment of a circle only an inch and half, or two inches in diameter. The female catheter is about six inches long, and straight, excepting a slight curvature towards its point.

An elastic gum catheter has the advantage of being less irritating to the urethra, and less apt to become covered with calculous incrustations, than silver tubes. In cases of obstruction in the urethra, they can also frequently be got into the bladder, when a silver catheter will not pass.

Sometimes the instrument is difficult of introduction, owing to a spasmodic affection of the urethra itself, the muscles of the perinæum, and the sphincter of the bladder. In this case, before a second attempt is made, a dose of opium may be administered. When inflammation is present, the introduction will often be facilitated by venesection and the warm bath.

The introduction of the catheter may be performed, when the patient is either standing up, sitting, or lying down; but that posture, in which the patient reclines on a couch or bed, is reckoned the most advantageous.

One of the most important maxims is never to force forward the instrument, when it meets with any obstacle. If there are no strictures, the stoppage of the catheter is always owing to one of the following circumstances: Its beak may be pushed against the os pubis. This chiefly occurs, when the handle of the instrument is prematurely depressed. Here the employment of force can obviously do no good, and may be the cause of serious mischief. The beak of the catheter may take a wrong direction, and push against the side of the urethra, especially at its membranous part, which it may dilate into a kind of pouch. In this circumstance, if force were exerted, it would certainly lacerate the urethra, and occasion a false passage. The end of the catheter may be entangled in a fold of the lining of

the urethra; and here force would be equally wrong. Lastly, the point of the instrument may be stopped by the prostate gland, in which event force can be of no service, and may be productive of great harm. Hence, it is always proper to withdraw the instrument a little, and then push it gently on in a different position.

As Richter states,\* the operation in the male subject may be divided into three stages; in the first, the catheter passes that portion of the urethra which is surrounded by the corpus spongiosum; in the second, it passes the membranous part of the canal, situated between the bulb and the prostate gland; in the third, it enters this gland and the neck of the bladder. In the first stage, little trouble is usually experienced; for, the canal is here so supported by the surrounding corpus spongiosum, that it cannot easily be pushed into the form of a pouch, in which the end of the instrument can be entangled. The operator need only observe the following circumstance: The penis should be held, by placing the corona glandis between the thumb and the index-finger of the left hand: in this way, the entrance of the urethra will not be at all compressed. The penis is then to be drawn upward, with moderate force. The catheter, being well oiled, is now to be introduced, with its concavity towards the abdomen, into the urethra, directly downward, until its point reaches the bulb. As soon as this occurs, and the beak of the instrument has passed under the arch of the pubes, the surgeon must very slowly bring the handle of the catheter forwards, between the patient's thighs, and in proportion as this is accomplished, the beak of the instrument becomes elevated, and glides into the bladder. When the beak of the catheter is stopped by the os pubis, the impediment is to be avoided by not depressing the handle of the catheter too soon; that is, before the point has passed beyond the arch of the pubes.

When the membranous part of the urethra is pushed to one side or the other, the catheter is to be withdrawn a little, and then pushed gently on in a different direction. When this expedient is unavailing, the index-finger of the left hand may be introduced into the rectum, for the purpose of supporting the membranous part of the urethra, and guiding the extremity of the catheter.

When the prostate gland is enlarged, the urethra generally turns upward very suddenly, just before its approach to the bladder, and of course in this case, the end of the catheter should be more bent upward than the rest of its curvature. According to Desault, a large catheter here usually answers better than a small one, and it may either be of silver or elastic

\* Anfangsgr. der Wundarzn. b. vi. pp. 232, 233, ed. 1802.



gum. The latter, though the best for the purpose of being kept in the passage, has not always sufficient firmness to get through the obstruction in the canal, not even with the aid of the stilet. In this respect, a silver catheter is sometimes preferable. But, whatever may be the kind of catheter employed, it generally passes as far as the prostate with perfect facility, where it is stopped, not only by the narrowness, but also by the new curvature of the passage; for the prostate cannot be enlarged, without pushing forwards and upwards, or to one side, that portion of the urethra, behind which it is situated. This is a circumstance which ought never to be forgotten, in regulating the length and direction of the beak of the catheter, which should be longer, more bent upwards, and more elevated at the time of its introduction, than in any other cases of obstruction in the urethra.\*

In swellings of the prostate gland, the late Mr. Hey found, that by withdrawing the stilet of an elastic gum catheter, the instrument became more curved; and he availed himself of this information, by withdrawing the stilet, as he was introducing the catheter beyond the arch of the pubes, by which artifice, the point of the instrument was elevated, in the due direction. His stilets were made of brass wire, about one-tenth of an inch in thickness.†

When such experiments fail, the surgeon should try catheters of various sizes and curvatures.

In the third stage of the operation, the beak of the instrument has to pass the prostate gland, and neck of the bladder. The chief impediments to its passage in this situation arise from a spasmodic contraction of the neck of the bladder, and from the instrument being pushed against the prostate gland. The first obstacle may be generally obviated by waiting a few moments, and gently rubbing the perinæum, before the catheter is pushed on. How the impediment, caused by the prostate, is to be eluded, the reader will understand from what has been already stated. Sometimes the surgeon himself presses the prostate towards the os pubis, by means of his finger in the rectum, and thus prevents the passage of the catheter, by increasing the sudden curvature at this part of the urethra.‡

In cases of enlarged prostate gland, Desault appears to have set the example to the French surgeons, of sometimes forcing a catheter into the bladder: after being tolerably certain (says Bichat) that the end of the catheter corresponds exactly to the direction of the urethra, and that the obstacle to its entrance

\* *Œuvres Chirurg. de Desault*, t. iii. p. 223.

† *Practical Obs. in Surgery*, pp. 397, 398, edit. 2.

‡ *Anfangsgr. der Wundarzneykunst*, band. vi. p. 240.

into the bladder only depends upon the narrowness of the canal, we may, without being too fearful of making a false passage, forcibly push forwards the catheter. It was acknowledged by Desault, however, that this plan would be attended with great danger in the hands of young inexperienced surgeons; and that it is only fit to be practised by those who, combining great experience in the use of the catheter with an accurate knowledge of the different curvatures of the urethra, have at length attained that degree of skill, which never lets them forget for an instant the situation and direction of the beak of the catheter. For if, while the instrument is forced on, the beak should be inclined too low, or to one side, &c., a false passage would inevitably be occasioned by a laceration of the membranous portion of the urethra; an accident, which is always of a serious nature, increasing the inflammation of the prostate, and rendering the introduction of the catheter more difficult.\* This bold practice, suggested in France by Desault, is now frequently pursued by Boyer and Roux, and sometimes in this country by Sir Astley Cooper, Mr. Pearson, &c.†

A catheter is sometimes introduced as far as the perinæum, with its convexity towards the abdomen; the point is then kept stationary, while the handle is made to describe a semi-circular movement downwards, so as to bring the concavity of the instrument towards the pubes, as it is situated in the common method.

When there was difficulty in introducing an elastic catheter with a stilet, Desault used sometimes to withdraw the wire about an inch, in order to allow the end of the instrument to become more curved; a method somewhat similar to the plan recommended by the late Mr. Hey; but with this difference, that the latter gentleman withdrew the stilet for the purpose of making the catheter bend more upwards at the moment when the beak of the instrument had arrived at the obstruction, over which it was wished to make it ascend.

#### INFLAMMATORY AND SPASMODIC RETENTION OF URINE.

Inflammation occasioning this complaint, is frequently situated about the neck of the bladder, in the urethra, or adjacent parts. The difficulty of voiding the urine is to be attributed partly to the spasmodic affection of the urinary passage itself, partly to the action and resistance made by the sphincter and muscles in the perinæum, and partly to the swelling arising from the inflammation. When the inflammation, however, is

\* See *Œuvres Chir. de Desault*, t. iii. pp. 224, 225.

† See *Cross's Sketches of the Medical Schools of Paris*, p. 115. 8vo. Lond. 1815.

not situated in the urethra and neck of the bladder, but in some neighbouring part, not sufficiently near for the swelling to have the effect of compressing the urethra, the immediate cause of the impediment to the expulsion of the urine must then be referred either to the resistance of the muscles above mentioned, or the contractile power of the urethra itself.

From these remarks it must be clear, that, in the retention of urine, now under consideration, both antiphlogistic and antispasmodic remedies are principally indicated. It is commonly believed, that a mere inflammation of the neck of the bladder may occasion retention of urine; but Desault\* thought the complaint generally owing to inflammation in the vicinity; because, inflamed muscles are not prone to contract.†

The inflammation, causing retention of urine, may arise from various circumstances; violent fits of the stone; very bad piles; the use of stimulating diuretic medicines, especially cantharides; the absorption from blisters; bruises of the perinæum; inflammation and abscesses about the perinæum and anus, &c. But the most frequent exciting cause of the spasmodic, or inflammatory retention of urine, is the irritation produced by strictures, and virulent gonorrhœa. From this account it is manifest, that besides taking care to employ antiphlogistic and antispasmodic remedies, it is also necessary to pay attention to each particular cause of the irritation.

The most powerful means for relieving this retention of urine, are, copious venesection; the application of leeches to the perinæum, or vicinity of the os pubis; the exhibition of opium by the mouth, and in clysters; the warm bath; tobacco in the form of an enema; and fomentations to the hypogastric region, and perinæum.

When these measures have been fairly tried, without success, the catheter is to be used; for the continued lodgment of the urine, and the distention, arising from its quantity, may soon cause paralysis of the bladder, and, in the course of three or four days, sloughing, and a fatal extravasation of urine; but if no kind of catheter can be introduced, not even a small one coated with elastic gum, and the other remedies and artifices spoken of in this chapter, and that on strictures, prove unavailing, it becomes necessary to puncture the bladder.‡

\* *Cœuvres Chirurg.* tom. iii. pp. 147, 148.

† { Mr. Abernethy has seen cases of retention of urine, which he thinks were undoubtedly caused by an irritable state of the sphincter vesicæ, though they do not appear to him to be of frequent occurrence. In these cases there was no enlargement of the prostate gland. }

‡ { When the retention depends upon an irritable and inflammatory state of the urethra, most judicious surgeons concur in the opinion of Mr. Pott, that it is wrong to employ instruments; at least until the inflammatory

## CHAPTER LII.

## PUNCTURING THE BLADDER.

MANY patients who undergo this operation, unquestionably lose their lives; but the frequent ill success should not be referred to the dangerous nature of the operation itself, so much as to the very diseased state of the urethra, bladder, and kidneys, often existing together with great debility, an impaired constitution, and a mass of abscesses and thickened parts, more than enough to account for the unfortunate result. Hence, the surgeon, who wishes to have greater success, must not let the disease attain so incurable a degree, and, in particular, should let out the urine at an earlier period than is usually done. I think it has been my lot to see several patients lost chiefly in consequence of this maxim not having been duly observed. We can hardly suppose, that a small wound, made in such parts as are divided in the operation, would of itself often give rise to the fatal termination of these cases. It has always appeared to me, that when the means, best calculated to promote the discharge of urine, have failed, after having had a fair trial, the making of an outlet for the urine, either by puncturing the bladder, or opening the membranous part of the urethra, according to circumstances, becomes immediately as much indicated, as the division of the stricture in cases of strangulated herniæ, when other means have not had the desired effect of liberating the bowels.

Mr. C. Bell states, that the fifth, sixth, and seventh days,

symptoms have been in some measure reduced: and Mr. Abernethy remarks upon the use of them, that the distress often induces the surgeon to attempt the introduction of the bougie; and though the patient for the time may be enabled to void his urine, the retention has recurred; and he believes, that for this temporary relief, the patient has generally had his sufferings prolonged. When the instrument is used in cases of spasmodic action of the muscles, by pressing the instrument gently against the obstruction for some time, the spasm for the time will be greatly increased; and though we may not succeed in passing the bougie through the obstruction, on withdrawing it, a proportionate relaxation of the muscles succeed, and the patient is enabled to void a part or the whole of the urine: upon the same principle, in part at least, may depend the benefit often derived from the distending the urethra by injecting any bland animal oil, which will be found in general less irritating than vegetable; and, after retaining it for a time by closing the orifice of the urethra, and then allowing it to escape, the urine will often be found to follow.}



from the commencement of the total obstruction, are those on which the urine may escape from the bladder into the abdomen; and, consequently, he recommends the operation to be performed on the fourth day.\*

Although I am an advocate for not delaying the operation, after milder methods have decidedly failed, I believe, that these methods will almost always prove successful in skilful hands, and that it may generally be avoided. In the opinion of Desault, there are very few instances in which a surgeon, expert at introducing the catheter, cannot pass it into the bladder, and, consequently, the cases, in which paracentesis is absolutely necessary, must be unfrequent.

The bladder may be punctured, either in the perinæum, above the os pubis, or through the rectum. Of the first operation I shall say nothing, for it is now almost exploded. I allude to the old method of opening the bladder, with a trocar, between its neck and the insertion of the ureter; for, cases frequently present themselves, in which, letting out the urine by an incision in the perinæum, is much more advisable, than either puncturing the bladder from the rectum, or above the pubes. But the operation to which I refer is not a hazardous thrust of a trocar at a point between the neck of the bladder and the insertion of the ureter, a point which can never be hit with certainty; but, a simple incision in the dilated membranous portion of the urethra. "If," says Mr. C. Bell, "a man have a stricture in the urethra, and the surrounding parts be indurated, so that there is no immediate hope of removing it by the caustic, or the bougie; if, with this, there have occurred a sudden obstruction, and the bladder has risen and has lost its action, and there remains no expectation of spontaneous relief, or of ease from lesser remedies, then I apprehend it is better to open the urethra in the perinæum behind the stricture. And, this is to be immediately done, if the symptoms indicate a rupture of the urethra, and effusion of urine."†

In retentions of urine from strictures, not admitting of relief by other means, Sir Astley Cooper also prefers the making of an opening in the urethra, to the practice of puncturing the bladder, which, in male subjects, he considers hardly ever necessary. In them, retention of urine mostly arises either from strictures, or disease of the prostate gland. Of the latter, Sir Astley has never seen a case in which a catheter, of proper form and size, could not be passed.‡

\* Operative Surgery, vol. i. p. 315.

† Surgical Obs. vol. ii. p. 61. 8vo. Lond. 1818

‡ Lectures, vol. ii. p. 315.

## OF THE PUNCTURE ABOVE THE TUBES.

Some surgeons make a perpendicular incision, about an inch and a half or two inches in length, through the integuments and fat, covering the lower part of the linea alba. The lower the incision is made, the nearer it is to that part of the bladder, which it is most advisable to puncture, and the further it is from the peritoneum. Hence, the inferior end of the wound should be directly above the pubes. A trocar, the curvature of which forms a segment of a circle seven inches in diameter, is now to be introduced through the linea alba into the bladder. It is to be held with its convexity towards the patient's navel, and pushed obliquely downward, and backward, in the axis of that viscus. Sir Astley Cooper, who uses a straight trocar, directs it towards the basis of the sacrum, and not so low down as I have always seen done; his reason is, that the risk of the instrument slipping between the pubes and bladder may be avoided.\* At all events, it is necessary to guard against this accident, which has frequently happened. A curved instrument of this kind is much less likely, than a straight trocar, to penetrate the back part of the bladder, and wound the rectum; besides, having this advantage, that, when the urine is evacuated, and the bladder collapses, the cannula will not be so apt, as a straight one, to be separated from the part in which it has been introduced.† Here we may discern another reason for making the puncture immediately above the pubes, and not an inch or two higher up, as Sharp and B. Bell have recommended; the bladder, which rises up between the peritoneum and recti muscles, descends again, when the urine is discharged, and, consequently, must be more liable to slip from the cannula, the higher the puncture is made.‡

When the operator perceives, by the want of resistance, that the point of the instrument is in the bladder, he is to take hold of the cannula, and push it further in, while he withdraws the stilet. After the urine has been discharged, some practitioners, amongst whom is Sir Astley Cooper, pass an elastic gum catheter, duly shortened, into the bladder, through the cannula, and then take the latter out.

\* Lectures, vol. ii. p. 309.

† Sabatier Médecine Opératoire, tom. ii. pp. 128, 129.

‡ Richerand, Nosographie Chir. tom. iii. p. 499. By the employment of a long trocar, of course the objection here specified might be removed; but the cannula of such an instrument has sometimes pressed against the opposite side of the bladder, and caused an ulcerated opening in it. If the patient be not very fat, Flurant's curved trocar, about five inches long, is an eligible instrument for the operation; the cannula of a shorter one is liable to slip out of the bladder, and make a repetition of the puncture necessary, as happened in the practice of Professor Schreger. See his Chirurgische Versuche, b. i. p. 212. Nurnberg, 1811.

An elastic gum catheter does not fill the wound; consequently the urine is discharged, not only through it, but also between its outer surface and the track of the wound, so that the chance of the urine becoming diffused in the cellular membrane is not guarded against, as it is by allowing the cannula to remain in the wound two or three days, until inflammation has agglutinated together the surrounding cellular substance. In some examples, the cannula, after having been kept a few days in the wound, was taken out, and readily introduced again, as occasion required.\*

Still, I do not feel authorized to recommend this proceeding; because it has happened, that the tube could not be replaced, and the urine became confined again, so that a repetition of the operation would have been absolutely necessary a third time, had not Schreger succeeded in procuring an evacuation through the urethra, by distending this canal with warm water, injected with some force into the passage, by means of a syringe and a cannula, introduced as far as the stricture would allow.†

Long, straight, silver cannulæ, have been known to form a communication between the bladder and rectum, in consequence of ulceration, or sloughing, produced by the pressure of their points on the back part of the bladder. Mr. Sharp saw this accident;‡ and a modern author informs us, that, in a case where a common trocar was used, he dissected the parts; “the bladder fell on the sharp edge of the trocar, this produced inflammation of the bladder and peritoneum, which occasioned the death of the patient.”§

The outlet, thus formed for the urine, is, of course, merely designed as a temporary one, until the impediment in the natural passage has been removed. In one case, seen by Sir Astley Cooper, where the latter object had not been accomplished, twelve months after the puncture, a female catheter was yet worn in the opening.||

This operation has the advantage of being generally done at

\* See Bohn über Harnverhaltung und Blasenstich, Leipzig, 1794; Noel, in Desault's Journal de Chirurgie, tom. ii.; Turner, in London Med. Journal, vol. xi.; Journal de Médecine, tom. lxxxiii.

† Versuche Chirurgische, b. i. p. 216. 8vo. Nurnberg, 1811. In cases of retension of urine, from calculi lodged near the neck of the bladder, Schreger employed the same artifice with success. It is this principle of distending the urethra with fluid, that has been so strongly recommended by Mr. Arnott, in various affections of that canal; a subject to which I have adverted in a previous chapter.

‡ See a Critical Inquiry into the Present State of Surgery, p. 127, edit. 4.

§ See a History of the High Operation for the Stone by Incision above the Pubes, and an account of the various Methods of Lithotomy, by J. C. Carpue, p. 176. 8vo. Lond. 1819.

|| Lectures, vol. ii. p. 310.

a distance from the diseased parts, and without risk of injuring any parts of importance. The chance of extravasation of the urine is not great. It is even conceived by a modern writer, that it should never be mentioned as an argument against this mode of puncturing the bladder, because when the cannula happens to slip out of the puncture, the little wound becomes impervious. In fact, this happened in Schreger's case, where the tube slipped out twice; viz. on the evening of the day on which the bladder was first tapped; and again on the third night from the second performance of the operation; for, after each displacement of the cannula, no probe could be passed into the bladder, no urine escaped, and that receptacle became enormously distended again. In other cases, however, to which I have referred, this closure of the puncture immediately after the displacement of the cannula, did not happen; it did not occur in an example related by Schreger himself, in which he took out the cannula of the trocar on the thirteenth day, and put in another;\* and it is therefore not to be regarded by any means as an invariable consequence of the tube slipping out. The displacement of the cannula, the possibility of not being able to get in another, and of an extravasation of urine, therefore, may still be considered objections to this method of operating. Another disadvantage is, that the opening is not made in a depending situation, and consequently the whole of the urine cannot be readily discharged. I have more than once seen this operation attempted, without the trocar reaching the bladder, or any urine being voided; and Mr. Carpue speaks of a case, in which the instrument, on going into the bladder, had pushed this viscus from its slight connection with the pubes.†

#### PUNCTURE THROUGH THE RECTUM.

The patient is to be put in the posture recommended for lithotomy. An assistant is to make pressure on the abdomen, just above the pubes, in order to render the prominence of the bladder more distinct to the surgeon's finger in the rectum. A curved trocar, with its point drawn within the cannula, is to be introduced with the right hand, and conveyed, upon the index-finger of the left, along the swelling, formed by the distended bladder. It should be kept exactly in the central line of the front portion of the rectum, and, when beyond the prostate gland, should be pushed into the bladder, through the anterior part of the intestine, as nearly as possible in the middle of a triangular space, bounded at the sides by the vasa deferentia and vesiculæ seminales, which converge to the prostate gland,

\* Versüch, Chir. b. i. p. 225.

† A History of the High Operation, &c. p. 177.



and behind by the line at which the peritoneum is reflected. If the puncture be made in the centre of this space, while the bladder is distended, there will be no danger of wounding the vasa deferentia, or vesiculæ seminales; and it may be made an inch behind the prostate, without risk of injuring the peritoneum.\*

This operation is so easy, safe, and free from severity, that it certainly merits a general preference. The coats of the rectum and bladder, at this part, are in immediate contact, and the instrument has to penetrate no thickness of substance. Sir Astley Cooper objects to it, on the ground that the irritation of the urine is likely to bring on disease of the rectum; a case, which Dr. Cheston met with: but I do not find this consequence noticed by other writers on the subject, who have had occasion to perform the operation.

In a former edition of this book, the directions which I gave for puncturing the bladder from the rectum, appeared to Mr. Carpue objectionable, inasmuch as the space beyond the prostate, where the puncture can be made, without any risk of wounding the peritoneum, is very short.† When first I heard of this criticism, I thought it of value, and my mind was quite open to conviction, as the only real wish ever entertained by me was to give such views of the practice of surgery as may be most beneficial to the afflicted. At the same time, it seemed to me rather extraordinary, that, though the operation had usually been done very much in the way explained in my book, and perhaps without due attention to the very short space, naturally left between the prostate and the cul-de-sac of the peritoneum, yet, I had never in the course of my reading met with any notice of the peritoneum having been thus injured. Future reflections have now persuaded me, that, just and accurate as Mr. Carpue's statement is, with respect to the anatomy of the parts in the healthy state, it is far from being so in regard to the same parts, in retentions of urine. In these cases, as Desault has correctly pointed out, the bladder spreads more from below upwards, than in any other direction. Its inferior portion becomes broader and more deeply situated, pushing the perinæum downwards and forwards, and the rectum backwards. The posterior part of the bladder, which is covered by the peritoneum, lifts the mass of small intestines upwards and backwards, and rises into the cavity of the belly.‡ When these changes are considered, together with the universal expansion of the bladder in its distended state, we shall immediately see, that the lowest point of the peritoneum, where this membrane

\* Sir A. Cooper, *Lectures*, vol. ii. p. 311.

† *A History of the High Operation for the Stone, &c.* by J. C. Carpue, pp. 178-180.

‡ *Œuvres Chir. de Desault*, t. iii. p. 113.

is reflected from the posterior part of the bladder to the rectum, must become considerably displaced in the direction upwards and backwards, and a much larger space be left for the safe introduction of the trocar, than would present itself in the natural state of the parts. I offer these remarks, however, only in explanation of what I had some difficulty in making out when I first heard of Mr. Carpue's observation, due attention to which I still consider highly necessary.

Perhaps no harm would generally result from immediately withdrawing the cannula. An instance is upon record,\* where the cannula was inadvertently withdrawn forty-eight hours after the operation, and could not be introduced again. The urine was discharged through the rectum six days; and as soon as it began to flow through the urethra, the wound healed, without leaving any fistulous communication between the bladder and the intestine. The cannula has even been withdrawn immediately after the operation, without any inconveniences.† A case, however, is mentioned by a modern surgeon, in which the cannula slipped from the wound on the seventh day, and as the bladder became distended again, a second puncture was considered necessary, and performed with success.‡ The safest practice, therefore, is that of keeping a tube in the puncture, until the impediment to the patient's making water in the natural way is removed; but, I would recommend the silver cannula to be withdrawn, on account of its annoyance, as soon as a flexible gum catheter has been introduced through it; a plan directed by Sir Astley Cooper.§ The catheter is to be fastened to a T bandage.

The operation of puncturing from the rectum is not eligible when the prostate gland is very much enlarged; when there are large hemorrhoids present; or when the rectum is diseased.

In women, the meatus urinarius is so capacious and short, that a catheter may almost always be introduced; but, if there were a necessity for puncturing the bladder, as there may be in a retroversion of the womb, the operation above the pubes is decidedly better, than tapping the bladder from the vagina, which, though very practicable, is apt to be followed by urinary fistulæ, a very distressing disease, always difficult of cure, and often incurable.

\* Bentley, in *Medical Communications*, vol. i.

† Richter's *Anfangsgründe der Wundarzneykunst*, band vi. p. 328, edit. 1802.

‡ Carpue on the High Operation, &c. p. 178.

§ Lectures, vol. ii. p. 312.

## CHAPTER LIII.

## INCONTINENCE OF URINE.

AN inability to retain the urine in the bladder is of three kinds: in one the water continually dribbles away without any inclination to void it, or any sensation of its being voided. In other instances, the patient can hold his urine in a certain degree; but, the propensity to evacuate it comes on so frequently, suddenly, and irresistibly, that he is compelled to discharge it. The third kind of incontinence only occurs when the patient is asleep.

The first case depends on a weakness, or total paralysis, of the sphincter muscle of the bladder. As the neck of this organ is constantly open, every drop of urine escapes into the urethra, immediately it has descended from the ureters, and does not lodge in the bladder at all. Sometimes the weakness, or paralysis, of the sphincter, is quite a local disorder; but, most frequently, it is symptomatic of some other affection. In the first case, it is often the consequence of a difficult labour, in which the neck of the bladder has been a long while compressed; or of the distention, caused by a stone in this situation. Sometimes, incontinence of urine depends on a malformation of the urinary passages, and exists from the time of birth. The complaint is often an effect of apoplexy, injuries, and diseases of the spine, &c.

It is not dangerous, though exceedingly annoying, in consequence of its continually wetting the clothes, causing a disagreeable smell, and even excoriating the parts over which the urine flows.

When the complaint is local, tonics and astringents are indicated; and the principal remedies are, cold bathing, bark, blistering the sacrum or perinæum, the tinctura cantharidum, the shower-bath, electricity, and rubbing the spine and sacrum with stimulating liniments.

When the incontinence of urine is merely an effect of another disorder, the latter claims the principal attention.

The second species of incontinence of urine, is of a spasmodic nature, and commonly depends on some irritation operating on the bladder. Hence, the indication is to find out the irritation, and, if possible, to remove it. Hemorrhoidal complaints, suppressed menses, a stone in the bladder, a fistula in ano, &c.

may cause the affection. When the particular irritation cannot be discovered, general soothing and antispasmodic remedies, such as opium, the warm bath, fomentations, &c. should be prescribed. The *uva ursi* is useful, of which a scruple, or half a drachm, may be given three times a day.

This kind of incontinence of urine is frequently only a symptom of epilepsy or hysteria. Sometimes, it originates from pressure made upon the bladder; and hence, it may be a symptom of polypi of the uterus, a prolapsus of this viscus, or difficult parturition.\*

The last case is that, in which the urine is involuntarily discharged in the night-time, when the patient is asleep. The infirmity is mostly met with in young boys and girls; and, for the most part, spontaneously goes off as they approach the adult state. They should avoid drinking any fluid just before going to bed, and empty the bladder before they go to sleep.†

When, in adult persons, the complaint does not yield to the above precautions, one-fourth of a grain of the powder of cantharides, given with milk of almonds, every evening, has been known to be of service. The effect of exhibiting a grain of opium, or two grains of *ippecacuanha*, every night, a little before bed-time, may also be tried.

In this treatise, I have not thought it necessary to describe any particular apparatus for catching the urine, in cases where no cure can be accomplished.

There is a particular incontinence of urine, arising from the formation of a preternatural communication between the bladder and vagina. It is usually the consequence of a slough, and sometimes follows difficult labours. The continual dribbling of the urine through the opening, generally prevents it from healing; but, by making the patient lie a good deal on her abdomen, the water is hindered from constantly escaping, and the aperture will sometimes heal.

Attempts have been made to close the preternatural opening, by scarifying its edges, and keeping them afterwards in contact with the twisted suture. If such an operation were practicable,

\* Retention of urine, from paralysis of the bladder, is a case attended with an involuntary dribbling away of this fluid, if the catheter be not properly employed, and is a disorder that has frequently been mistaken for an incontinence of urine. As soon as the bladder is distended to a certain degree, the urethra being unobstructed, the continued secretion from the kidneys, instead of causing the bladder to give way, passes off through the natural channel. The discharge of urine leads the unwary surgeon never to suspect the real nature of the disease; but if a catheter chance to be introduced, the quantity of urine drawn off, immediately throws light upon the true character of the disorder.

† See NOTE M.



it would be proper to make the patient lie on her abdomen, as much as possible, for two or three days, till the suture were removed.

## CHAPTER LIV.

### IMPERFORATE VAGINA.

IN cases of this description the vagina is commonly found shut up by a membrane, which is, in fact, the hymen, without any aperture in its centre. In new-born infants, this membrane sometimes extends so far forward, that it covers the orifice of the meatus urinarius, and prevents the evacuation of the urine.

When the membrane is situated behind the meatus urinarius, no inconvenience is perceived until the period, when the menstrual discharge commences. As this evacuation cannot escape externally, it accumulates in the vagina, so as to occasion several local and general complaints, which lead to an examination of the parts, and to the detection of the malformation. Pain in the loins; a sense of heaviness and tension in the uterus; hardness of the abdomen; frequent propensity to make water, and even a retention of urine; pain in going to stool, &c. are the inconveniences usually resulting from the imperforate vagina. The patient is also observed to have no evacuation from the uterus, at the age, when it naturally ought to take place.

At first, these complaints are only experienced once every month; but, when a large accumulation of blood has occurred, they continually afflict the patient. At length, giddiness, paleness, swelling of the belly, drowsiness, and efforts, like those of labour, exasperate the state of the case.

The nature of the disorder may easily be detected by an ocular examination. Careless practitioners, however, are apt to fall into error, and suppose, that all the above complaints originate from chlorosis, or pregnancy.

The operation for the relief of this case is very simple. The surgeon is to divide the membrane by a longitudinal incision, made from the place just below the meatus urinarius downward. After the accumulated fluid has been evacuated, the edges of the divided membrane are to be kept asunder for two or three days, by means of a dossil of lint. If the dark, thick discharge, does not easily escape, warm water must be injected, to promote the evacuation.

Although the operation has been performed with entire success, and several pints of blood have been discharged, three or four years after the commencement of the disease, yet, it ought to be known, that a considerable delay is always attended with two dangers. In the first place, when the blood accumulates in such quantity, that the vagina cannot contain it all, the uterus next becomes distended, and this fluid may escape through the Fallopian tubes, and be extravasated in the abdomen.\* Secondly, when the menstrual evacuation has been a long while prevented from taking place in the natural way, in consequence of obstruction in the vagina, it may never admit of being re-established, notwithstanding the mechanical impediment be now removed. It is asserted, that in one example of this sort, the menstrual discharge continued to be determined to the lungs and kidneys, although the obstacle to the evacuation being made in the natural way, had been obviated by a surgical operation.†

Sometimes, the vagina is closed, not by a membrane, but by a concretion of the opposite surfaces of the labia, nymphæ, and mouth of the vagina. No opening is discernible, except a small one, from which the urine flows. At the same time, there is always to be seen a white raphe, or line, extending from the aperture directly downward, and easily distinguished from the other parts by its firmness and whiteness. This case is sometimes an original malformation: but, in other instances, it results from neglecting to keep the parts asunder, when in an excoriated state.

When a director can be introduced through the above opening into the vagina, the surgeon is to imitate Saviard, and pass a straight narrow bistoury along the groove of the instrument, and then make a division of parts, in the direction of the above-mentioned raphe.‡ When the director cannot be introduced, the surgeon must use the knife cautiously, taking care not to wound the rectum or bladder.

When only the nymphæ are adherent together, the separation is very easily accomplished.

The divided surfaces are always to be kept asunder, by means of lint, or pieces of sponge, until the parts are completely cicatrized.

Sometimes, in consequence of a congenital malformation, the opening of the vagina is closed by a fleshy mass. In one instance, the tumour seemed to grow from the inner surface of the labia, having, just below the clitoris, a small aperture, out of which the urine escaped. A probe, which was introduced, passed into the bladder, but could not be made to enter the

\* See De Haen's *Ratio Medendi*, pars sexta.

† Bresslauer *Sammlungen*, 1757.

‡ See Saviard's *Obs. Chirurgicales*, obs. 32.

vagina. An incision, however, being made through the middle of the fleshy mass, the vagina was opened. The portion of the tumour on each side was cut away, without any hemorrhage of importance, and a cure followed.\*

In particular cases, the vagina is imperforate at a part more or less distant from its external orifice. The closure may be owing to adhesions, that have arisen from inflammation of the passage, after a difficult labour, or some other cause. They can only be detected by manual examination, and with regard to the treatment, surgical writers recommend us to divide them with a pair of blunt-pointed scissors.†

In certain instances, a preternatural membrane, more or less deeply situated, entirely shuts up the passage. The further such membrane lies inwards, the more difficult are its detection, and the operation. Both, however, are facilitated by the menstrual discharge, which accumulates behind the membrane, urges it forwards, and makes it tense. When the vagina is thus imperforate at a distance from its external orifice, the menses may accumulate in the uterus, and not only distend this organ, but also the Fallopian tubes, and be extravasated in the abdomen, producing fatal consequences. These tubes have even been found lacerated.‡

When the preternatural membrane does not altogether close the vagina, and is deeply situated, it may never be detected; for, it does not prevent the evacuation of the menses, nor the act of copulation. But, if it be firm and indurated, it may prove a hinderance to parturition, or else lead to a dangerous laceration of the parts, unless a timely division of it be made, as the observations of those eminent writers, Ruysch, and J. L. Petit, confirm.§

Occasionally, the sides of the vagina itself becomes adherent to each other, or the canal is rendered imperforate, by the effects arising from ulceration and sloughing in the passage, the contraction of cicatrices, &c. Such mischief may be produced by difficult labours, or other causes. Examples are recorded, in which the vagina was closed to a considerable extent, and yet a cure was accomplished by dividing the obstruction. The following case is, in many respects, interesting. A young woman, twenty years of age, was affected with a hard swelling in the abdomen, below the navel, and with another smaller one, of the size of a hen's egg, situated on the left side. There also

\* Donauld, in *Journal de Médecine*, tom. xxxvii.

† Richter's *Anfangsgr. der Wundarzneykunst*, band vi. p. 368.

‡ De Haen's *Ratio Medendi*, pars sexta; and Sabatier's *Médecine Opératoire*, tom. i. p. 365.

§ See *Observationum anatomico-chirurgicarum centuria*. Amstelod, 1691, in 4to; and *Traité des Maladies Chirurg.* tom. iii. p. 110.

existed a preternatural formation of the parts of generation. Instead of the vagina, only a fissure, about half an inch long, was observable, into which the point of the finger could be introduced. The bottom of this slit was entirely closed, and had a hard, firm feel. The patient experienced a sense of pressure and weight about the pelvis, and back, and pain in the hips; she lost her appetite, had a short respiration, and an accelerated pulse. She was also costive, and troubled with frequent inclination to make water; but could only discharge it by drops, and with much pain. These symptoms sometimes became milder; sometimes, more severe. When they were violent, the abdominal swellings, which were regarded as being situated in the uterus and ovary, constantly acquired an increase of size. The bottom of the fissure was punctured with a lancet, and on the incision being carried to the depth of two inches, the retained menses began to be discharged, which were thick, and void of all bad smell. After about four pints had issued, the evacuation spontaneously ceased. The swellings in the abdomen had now diminished, though they had not entirely disappeared. As the patient, the day after the operation, was feverish, suffered a good deal of pain in the back, and her belly swelled, an emetic was administered. This excited a large evacuation of more bloody fluid, whereupon all the bad symptoms, and the tumour in the abdomen, completely subsided.\*

In some unusual examples, the os tincæ itself is imperforate, either in consequence of congenital malformation,† or of an obliteration of it by disease. When the opening is merely closed by a membrane, the menses themselves, after accumulating in a certain quantity, burst the unnatural obstruction, and effect a permanent cure.‡ Should this not happen, relief may be obtained by simply making a puncture with a curved trocar. When, however, the mouth of the womb is totally obliterated, an operation is a more hazardous proceeding. The attempt, indeed, has been known to be followed by violent inflammation and death.§ Yet, in some other instances, it has proved successful.|| After the operation, injections must be employed, and an elastic catheter may be introduced, as well for this purpose, as for that of keeping the new opening pervious. In fact, in one case, the aperture closed, and a second operation was necessary.‡

\* See Duncan's Medical Commentaries, vol. ix.

† Hemman's Versuche and Journ. de Médecine, tom. lxxv.

‡ Block's Bemerkungen.

§ Matthieu, in Hist. de la Société Royale de Médecine, ann. 1777, 1778.

|| Hemman.

¶ See Richter's Anfangsgr. der Wundarzneykunst, band vi. kap. 18; and Hemman's Versuche.



## CHAPTER LV.

## IMPERFORATE ANUS.

OF this case there are three varieties. In the first, the anus is either closed by a membrane, or it is too contracted to allow the feces to be easily evacuated. In the second, the anus appears to be properly formed, and the finger, or probe, may be introduced into the cavity of the rectum, for some way; but the bowel terminates in a *cul-de-sac* above the anus. In the third kind of case, there is no vestige whatever of the anus.

With such malformations, we may arrange cases, in which the rectum opens into the bladder, urethra, or vagina. When such a circumstance occurs in female children, they may possibly live, in consequence of the great dilatation of which their urethra is susceptible, and the vagina being a sufficiently capacious passage for the exit of the feces. Male children, on the contrary, must inevitably perish.

The first kind of imperforation is easily distinguishable. The child does not discharge the meconium; he makes great efforts, which are at last attended with convulsions. A membrane, of rather a transparent nature, is visible in the situation of the anus, and through it, the colour of the meconium may be seen. In consequence of the continual efforts, which the infant makes, the membrane becomes more and more protruded, so as to form a tumour. When there is a very small opening, the fluid part of the meconium escapes; the child makes less considerable efforts; but, these are sufficient to excite alarm. The defect is readily detected by an examination.

If the anus should be closed by a membrane, this may have a crucial incision made in it, and, if necessary, the angles may then be removed. The frequent evacuation of the intestinal matter will be quite sufficient to keep the opening pervious.

When there is an aperture at the anus, but it is too narrow, it must be dilated, in the most convenient direction, by means of a crooked bistoury and a director. This case is not so simple as the former one; for, the extremity of the rectum may be contracted, as well as the integuments. In this circumstance, the edges of the wound will be very prone to contract again, if not kept mechanically dilated, until a complete cicatrization has taken place. The whole of the sphincter ani may

also be cut, and an inability to retain the feces be the irremediable consequence.

The second species of imperforate anus is highly dangerous, on many accounts; but, particularly, because very liable to be a long time unnoticed, by reason of the external appearance of the parts being natural. The impediment to the passage of the excrement may be ascertained by introducing the little finger into the rectum, or, when this is impracticable, by using a probe. If the obstruction is near the end of the rectum, a division of it may be made with a narrow knife. M. Sabatier recommends cutting from the sacrum, towards the scrotum, or pudenda.\* Any stoppage, situated far up the intestine, can only be removed by puncturing it with a trocar, introduced through a cannula. The instrument should have a curve, corresponding to the semilunar form of the rectum. This operation is performed, as it were, in the dark, and is, by no means, a pleasant one to undertake.†

The third kind of imperforate anus, presents nothing externally, by which the situation of the end of the intestine is indicated. This part may be so remote, that it would be impossible to find it by any practicable method. How can cutting instruments be employed in so deep a situation? If the operator were to succeed in procuring an exit for the meconium, through what a thickness of parts would it not have to pass? The light of anatomy, as M. Sabatier observes, would here be invoked in vain. Almost all infants have died soon after an operation for this sort of imperforation, even though the rectum had been found and opened.

In these cases it has been proposed by Littre to cut into the abdomen above the left groin, and to endeavour to establish an artificial anus, by opening the colon in this situation. Such an operation, indeed, seems to have been practised with success by a French surgeon, named Duret.‡

A very curious example is recorded, in which the end of the rectum was closed, but a sort of appendix proceeded from it over the prostate gland, between the erectores penis and acceleratores urinæ muscles, passed along under the urethra, and terminated in a small opening near the frænum. The child was saved by an incision made into the rectum, in the natural situation of the anus.§

One would suppose, that an imperforate anus, that does not

\* Médecine Opératoire, tom. i. p. 353.

† See NOTE N.

‡ Sabatier, Médecine Opératoire, tom. i. p. 355.

§ Flajani, Collezione d'Osservazioni e Riflessioni di Chirurgia tom. i. p. 18. Roma, anno 6.

admit of being remedied, must unavoidably prove quickly fatal. Yet, if credit is to be attached to certain cases on record, children may live several months,\* and even years,† with an imperforate anus, the excrement, during such time, being ejected by vomiting, as often as occasion requires. For my own part, I am inclined to judge of the veracity of these instances, by considering, according to the maxim of Hume, which would be the greatest miracle, the truth of these marvellous assertions, or the falsity of the evidence by which they are supported.

## CHAPTER LVI.

### FISTULA IN ANO.

THIS term is applied to every abscess in the vicinity of the anus; but very improperly; for, the idea of there being a fistula, naturally leads to the adoption of measures, totally different from those which are applicable to common abscesses.

Sometimes, the complaint makes its attack, in the form of phlegmonous inflammation, attended with sympathetic fever. A part of the buttock near the anus is considerably swelled, and has a large circumscribed hardness, the middle of which soon becomes very red, and matter forms in its centre.

On other occasions, the fistula in ano begins as an erysipelatous inflammation, without any of the circumscribed hardness, which characterizes the preceding tumour. The redness spreads more extensively; the disease is more superficial; the quantity of matter small; and the cellular membrane sloughy to a considerable extent.‡

Sometimes, the complaint begins somewhat like a carbuncle. The skin is of a dusky red, or purple colour, and, although harder than in the natural state, not nearly so tense as in phlegmonous, or erysipelatous inflammation. At first, the pulse is full and hard; but, if no relief be obtained, it soon becomes unequal, low and faltering; and the strength and spirits are greatly dejected. The matter formed under the skin, is small in quantity, and bad in quality, and the cellular membrane is in a sloughy state. This species of the disease affects persons,

\* Journal de Médecine, ann. 1770, p. 510.

† Lib. cit. tom. viii. p. 60.

‡ See NOTE O.

whose habit is either naturally bad, or has been rendered so by intemperance.\*

These different affections often influence parts in the neighbourhood of the disease. Hence retention of urine, strangury, prolapsus ani, tenesmus, piles, diarrhœa, or obstinate costiveness.

Sometimes the fistula in ano first appears as an induration of the skin near the anus; but without pain, and alteration of colour; which hardness gradually softens and suppurates.

The matter may either point in the buttock, at a distance from the anus; or near this latter part; or in the perinæum. The matter may escape from one opening, or from several. Sometimes, there is not only an external aperture, but another internal one communicating with the cavity of the intestine. In other instances, there is only one external or internal opening.

The matter may be formed at a considerable distance from the rectum, which is not even laid bare by it; in other cases, it is laid bare, but not perforated; sometimes it is both denuded and pierced.

From what has been already stated, it will be seen, that many abscesses about the anus are connected with a bad state of the health. When quite a local disease, it is said generally to arise from obstinate costiveness, and the irritation of the muscles and cellular tissue of the rectum by the passage of indurated feces. Severe diarrhœa, accompanied with tenesmus and great determination of blood to the rectum, has also been known to bring on the complaint. But, according to Sir Astley Cooper, the most common cause is disease of the liver, which, preventing the free return of blood from the intestines, and influencing their secretions, leads to inflammation at the anus.†

When the inflammation is phlegmonous, the thinner the skin is suffered to become, before the abscess is opened, the better. If the patient be of a full, sanguine habit, venesection, leeches, and mild purgatives, are proper in the early stage. The confectio sennæ with sulphur is one of the most eligible aperient medicines. An emollient poultice is the best application; and, if the pain be very severe, leeches and fomentations should be employed.

When the attack is of an erysipelatous kind, and there is a sloughy state of the cellular membrane, the sooner the part is opened the better. As Mr. Pott observes, if we wait for the matter to point, we shall wait for what will not happen, at

\* See Pott's Chirurg. Works, vol. iii.

† Lectures, vol. ii. pp. 327, 328.



least, not till after a considerable length of time, during which the disease will extend itself, and the cavity of the abscess be greatly increased.

When the fistula in ano commences with that kind of inflammation which a carbuncle exhibits, no evacuations are necessary. The part should be opened early by a very free incision.

In opening all abscesses about the anus, the incision should divide the whole of the skin covering the matter. Thus the abscess will be discharged at once; future lodgment of matter will be prevented; and convenient room will be made for the application of proper dressings.

All fistulæ in ano do not necessarily interest the rectum; sometimes the matter is so distant from the intestine, that the surgeon has no more to do with this part than if it did not exist, and the abscess is to be treated upon general principles.

The idea of callosity, naturally attached to the term fistula, is the great cause, why former surgeons were in the habit of distending abscesses, about the anus, with escharotics, and why they even sometimes cut away considerable portions of flesh. It is true, hardness generally surrounds fistulæ in ano; but it is only such as accompanies every other description of abscess.

The dressings ought to be so small in quantity, as to allow nature to approximate the sides of the cavity together, and they should be quite unirritating.

By this simple treatment, the necessity of meddling with the rectum will often be removed. But, it more frequently happens, that the intestine, although not pierced by the matter, has yet been so denuded, that the sinus will not heal, without laying the cavity of the abscess, and that of the intestine, into one. According to Sir Astley Cooper, the difficulty of healing many abscesses near the rectum, depends upon their being influenced by the action of the sphincter and levator ani muscles, which have a constant tendency to prevent the union of the granulations and coalescence of the sinus.\*

The operation consists in dividing the rectum, from the top of the hollow, in which the matter is lodged, as far as the anus. Thus the sinus is converted into an open wound. A narrow, curved, probe-pointed knife, is the proper instrument, and if it can be guided by the director, introduced through the track of the fistula, quite as far as the intestine, so much the better. The surgeon's forefinger in the rectum will here feel the point of the knife. Then the director, if used, is to be withdrawn, and the operation is to be completed, by bringing the knife out, with its point applied to the finger, within the intestine. In

\* Lectures, vol. ii. p. 325.

this manner, all that is between the edge of the knife and the anus must obviously be divided.

Immediately after the operation, a soft dossil of fine lint should be introduced, from the rectum, between the lips of the incision. This first dressing should remain, till loosened by suppuration. All the future dressings should be light, soft, and unirritating. A T bandage is usually employed.

We have now to consider *fistulæ* in ano, in the state in which they are after having spontaneously burst.

When the matter has made its escape only through external openings, they are termed *blind external fistulæ*. Sir Astley Cooper has several times known a sinus form on each side of the anus, and communicate round the rectum. He examined the body of a man, who died of a discharge from a sinus in the groin, and who had a fistula in ano: the sinus passed under Poupart's ligament, took the course of the vas deferens, and descended into the fistula in ano. Sometimes, as the same practitioner observes, the sinus only just reaches the sphincter, and is extremely small, appearing at first only as a suppuration of one of the follicles of the anus. Sometimes, it reaches four inches up the side of the rectum.\* When there is an opening in the intestine, and none in the skin, the fistula is called a *blind internal fistula*.† *Fistulæ*, having an opening, both in the skin, and gut, are termed *complete*. The first and last cases are the most common. A probe is to be introduced to ascertain their nature, and the operation, already described, is the proper one for obtaining a cure. When there are several openings, and corresponding sinuses, they are all to be divided with a curved bistoury, so as to make one cavity of the whole.

In cases of *blind internal fistulæ*, if the bursting and discharge of the matter should not produce a cure, which they sometimes do, though very seldom, an external opening is to be made, and then the same operation, as has been already described for other cases, is to be put in execution. The place for the opening is always sufficiently denoted by the induration.

When the sinuses become truly fistulous, in consequence of mismanagement, and their long existence, they should be freely opened, and dressed with simple unirritating applications. Sometimes, the health will yet require to be improved, before

\* Lectures, vol. ii. pp. 326, 327.

† {Several of these blind internal *fistulæ* may exist at the same time, generally opening into the rectum, a short distance within the anus, producing a highly irritable state of the mucous membrane; and, in particular, when connected with tumours around the anus, cause great distress whenever the patient passes his feces. The tumours, when they exist, should be removed by the knife or scissors, before operating for the *fistulæ*. The *fistulæ* may generally be readily detected by a blunt hook, passed into the rectum. }

a cure can be accomplished, and many patients, who cannot recover in hospitals, do so on removing into a better air.\* Sir Astley Cooper says the medical treatment of the fistula in ano (meaning a particular form of it connected with visceral disease) consists in restoring the secretions of the liver, and intestinal tube, by submuriæ hydrargyri, or pil. hydrargyri at night, and the compound infusion of gentian, with soda and rhubarb, twice in the day.†

## CHAPTER LVII.

### POLYPI OF THE UTERUS.

RUYSCH has given a much better account of polypi of the uterus, than any of his predecessors, and has correctly represented these sarcomatous swellings as being attached to the uterus by a pedicle, just in the same way as nasal polypi are connected to the pituitary membrane.‡ But the honour of having elucidated this branch of morbid anatomy, in a greater degree than any other man, is particularly due to Levret. From his numerous observations,§ as well as from others of later date, it appears, that polypi of the uterus are of three kinds, in respect of situation. They either grow from the fundus, the inside of the cervix, or from the lower edge of the os uteri. The first case is the most frequent; the last the most uncommon. Polypi of the uterus are generally of a pyriform, or roundish shape, with a thin pedicle, and are almost invariably of that species, which is denominated fleshy; hardly ever being scirrhus, cancerous, or ulcerated. They are for the most part single, of a reddish colour, and a fibrous vascular texture.

The polypus, growing from the fundus uteri, is very difficult to detect in its incipient state. While small, it produces not the smallest perceptible change in the organs of generation. As it increases in size, it distends the uterus, causes a slight enlargement of the abdomen, and often excites a suspicion of pregnancy, which, however, a more attentive investigation soon

\* See NOTE P.

† Lectures, vol. ii. p. 328.

‡ Ruysch, *Observat. Anat. Chir. obs. 6, et. 58.*

§ See his *Observations sur la Cure radicale des Polypes de le Matrice et du Nez*, 8vo. Paris, 1759; and his *Essay on the same subject in Mémoires de l'Acad. Royale de Chirurgie*, tom. viii. edit. 12mo.

dispels. The swelling of the abdomen does not take place in the degree, and space of time, which it does in gestation; the menses continue to flow; the breasts do not become full; and, in the progress of the case, no motion is to be felt. While the polypus lies in the uterus, its growth is slow. Even at this early period, it frequently occasions profuse bleeding. Women, afflicted with the disease, are seldom pregnant; and when they are so, parturition commonly happens prematurely. Sometimes, however, they conceive, go through utero-gestation without inconvenience, and delivery takes place in the regular manner.\*

As the polypus increases, it expands the os uteri, and at length protrudes into the vagina. Sometimes this event is preceded by pains similar to those of labour. When the tumour has arrived in its new situation, as it is no longer compressed by the uterus, it begins to grow more rapidly, and occasions far more troublesome complaints. It presses the bladder and rectum, and thus is apt to disturb the evacuation of the urine and feces. But, in particular, it causes repeated and profuse hemorrhages, which weaken the patient exceedingly, and often bring her to the brink of the grave. The root of the polypus is situated in the os uteri, and is there so compressed, that the blood in the tumour is prevented from returning through the veins: consequently, all the vessels become turgid, and the above effusions of blood are the result. Though these generally cease spontaneously, the least circumstances cause their recurrence, even slight concussions of the body in walking, &c. In the intervals of such hemorrhages, a profuse quantity of thin mucous fluid is voided, by which the strength is still more reduced. The polypus, the source of this blood, and the cause of all this mucous discharge, is frequently misunderstood, and the patient is in a perilous state. Hence, in cases of preternatural discharge from the uterus, the propriety of always examining *per vaginam*.

After the polypus has remained some time in the vagina, it at length forms an outward protrusion. Now it again excites additional grievances. As it cannot descend so low, without dragging the fundus uteri downward with it, and occasioning a prolapsus of that organ, a very painful sensation is generally experienced in the pelvis in standing or walking. The bladder and ureters being also forced into a deranged position, the evacuation of the urine is disturbed or impeded; while the flow of the urine over the polypus, friction, &c. frequently make the tumour inflame, become painful, and even ulcerate.

The polypus, situated in the vagina, or protruding externally,

\* Levret, Mémoires de l'Acad. de Chirurgie, t. iii. p. 543.



may easily be mistaken for a prolapsus uteri. This serious error may as easily be avoided. The polypus is softer, and less sensible, than the uterus in the state of prolapsus. The imperfect prolapsus uteri, in which this viscus is not turned inside out, is betrayed by the os tinæ, which is plainly perceptible at its lower part. In this situation, the polypus may, indeed, occasionally have a depression, resembling the os tinæ, but easy of discrimination from it. A probe can be introduced deeply into the os tinæ; but not into the other sort of aperture. The polypus resembles an inverted pear, that is, it is thickest below, and becomes gradually thinner upwards. The above species of the prolapsus uteri is thinnest below, and gradually increases in width upward. A probe may be introduced by the side of the polypus deeply to the fundus uteri. When passed by the side of the fallen uterus, it is very soon stopped.

It is much more easy to distinguish a polypus protruded externally, from a perfect prolapsus of the uterus without inversion. The os uteri at once characterizes the uterus, as it can here not only be felt, but seen. A probe may be passed deeply into the vagina along the side of the polypus, but not so by the side of the uterus. Besides, the figure of each kind of tumour betrays its real nature.

Some uterine polypi have been known to become in time as large as a bullock's heart, and weigh three or four pounds. In this state, their round shape has sometimes caused them to be mistaken by inattentive practitioners for an inversion of the uterus. The latter accident, however, has usually been preceded by a difficult labour, and hence may, in general, be easily discriminated from a polypus.\* While the inverted uterus lies in the vagina, its shape is broad above and narrow below: whereas, the polypus is thin above and broad below. For this reason, in cases of very large polypi in the vagina, the os uteri is little dilated, while it is extremely distended by the incomplete descent of the inverted uterus itself. A recent inversion is generally reducible; but if a polypus be pushed up, it descends again immediately the pressure is discontinued.

When the inverted uterus hangs out of the vagina, its figure, like that of the polypus, is thin upward and broad downward, and, like the latter tumour, it has no aperture at its lowest part. Here an erroneous opinion has often led the way to a most mischievous practice, that of amputating the uterus itself, on the supposition of its being a polypus. It is to be observed, that the inverted uterus includes a circular fold at its upper part next to the orifice of the vagina. This fold is actually the os uteri

\* In a few uncommon instances, polypi have first protruded immediately after delivery.

itself, through which the body of the viscus has descended. There is nothing of this kind to be felt in cases of polypi. The finger, or probe, may be introduced deeply into the vagina along the side of a polypus, but not so far along the side of the uterus. The root of a polypus is firm and hard; the upper thin part of the uterus being hollow, has a soft, flabby feel. The uterus is also generally described as being much more tender and sensible than a polypus. Difficult labour, the common cause of the inverted uterus, also throws light on the case.

But, notwithstanding the many differences usually pointed out as marks of discrimination between inversions of the uterus and a polypus, whoever will take the trouble of consulting a valuable essay, already referred to in a previous chapter, will agree with Mr. Newnham, that it is *always difficult*, and, perhaps, *sometimes impossible*, to distinguish *partial and chronic inversion of the uterus from polypus*; since, in both diseases, the os uteri will be found encircling the summit of the tumour, round which part the finger may also be readily passed. And, says this author, if, in order to remove this uncertainty, the entire hand be introduced into the vagina, so as to allow the finger to pass by the side of the tumour to the extremity of the space remaining between it and the os uteri, and we find, that the finger *soon* arrives at this point, it will yet be impossible to know, whether it rests against a portion of the uterus, which has been inverted in the *usual way*, or *by the long-continued dragging of a polypus upon its fundus*. Nor will any certainty be gained by adverting to the ordinary *form of the polypus, its enlarged base, and narrow pedicle*, since the records of the profession furnish abundant evidence, that the neck of such a tumour is often as large, and sometimes larger, than its inferior extremity. And, as for the uterus forming a more sensible tumour than a polypus, it is always difficult to distinguish between the sensibility of the tumour, and sensation occurring in neighbouring viscera, which are irritated by the process of examination. The sensibility of the inverted uterus is also greatly diminished in its chronic stage, while the sensibility of a polypus may be increased by inflammation. The polypus is generally said to be a more movable swelling, than an inverted uterus; but, if it should have a broad stem, it may be quite as fixed as the uterus, which has been long partially inverted, and has had its size lessened by time. Both diseases, it is asserted, may present a smooth or a rough surface, according to their period, and other circumstances. The history of every case is further obscured by the fact, that, though inversion of the uterus mostly follows labour, polypi may first make their appearance in the vagina, immediately after the expulsion of the fœtus, or placenta. It is also remarked, that an examination of

the hypogastric region will not bring us more certain information; for, independently of the difficulty of feeling the impregnated uterus above the pubes, especially in fat subjects, a large polypus always drags down the uterus further into the pelvis. And if the inversion could be thus detected, it would not be known whether it were the effect of the weight of a polypus or not.\*

Polypi, growing from the inside of the cervix, or from the margin of the os uteri, soon protrude into the vagina, and, when large, produce similar complaints to those arising from such polypi as grow from the fundus uteri, except frequent profuse bleedings. These seldom occur, because the root of the tumour suffers no constriction in the os uteri. And, as Mr. Levret observes, the patients are more frequently troubled with fluor albus, and a profuse thin discharge, than with actual losses of blood. Hence the necessity of manually examining per vaginam, whether the patient has either a sanguineous or a mucous discharge. Patients, with polypi growing from the cervix uteri, feel an uneasy sense of weight about the rectum and perinæum, whereby they are prevented from sitting down with comfort. It deserves attention also, that the finger cannot be passed round the pedicle of the tumour, as it can when the disease grows from the inside of the fundus uteri. When such polypi descend out of the vagina, they may occasion a prolapsus uteri, but not an inversion.

Uterine polypi have sometimes been got rid of by the spontaneous efforts of nature: this has happened, when they have been expelled from the uterus, and had their pedicles so strangulated by the cervix of this organ, as to make them slough away. This mode of cure, however, is to be considered as uncommon, not to be expected, and, perhaps, not desired.

Women who have had children, and others who have not, are reckoned equally subject to polypi of the uterus: nor is the cause of the disease at all known. Experience also proves, that swellings of this nature may even form in the wombs of young girls, exciting complaints resembling those, which usually indicate the commencement of menstruation.†

Uterine polypi, when once extirpated, are not so prone to be reproduced as those of the nose. They ought never to be directly pulled off, as the attempt might produce a prolapsus uteri. A few instances occur, however, in which they may be conveniently twisted off. This is sometimes the case, when

\* See an Essay on the Symptoms, Causes, and Treatment of Inversio Uteri, with a history of a successful extirpation of that organ during the chronic stage of the disease, by W. Newnham, Esq. pp. 82-85. 8vo. Lond. 1818.

† Desault. *Journal de Chirurgie*, tom. iv. p. 276.

the pedicle is very thin, or after a ligature has been applied a certain time.

The ligature is the most proper means of extirpating uterine polypi, and is here much more easy of application, than in the nose.

That a polypus cannot be tied, while it lies in the uterus, is easily comprehensible. But, as soon as it has descended into the vagina, the operation is practicable.

The most convenient mode of applying the ligature is by means of two silver cannulæ.\* Previously to tying a polypus, I think the advice delivered by Loder well deserving recollection, viz. that the utmost pains should always be taken by the surgeon before the operation, to make himself as accurately informed as possible about the exact point, into which the pedicle of the tumour is inserted. For this purpose, a strong probe will sometimes be a convenient instrument. Inattention to this precaution has occasionally made the operator commit the serious mistake of including a portion of the substance of the uterus itself in the ligature. Such an accident once happened to the celebrated Dr. W. Hunter, as he himself confessed to Loder, and the consequences were mortification of the uterus, and the death of the patient.† It is hardly necessary to mention, that after the tumour has been tied, bleeding, injections, clysters, anodyne and other medicines, may be required.

When a large polypus, with a pedicle attached to the fundus uteri, suddenly falls down, it frequently occasions an inversion

\* See Plate 10. A strong ligature is to be introduced through both cannulæ, so that its two ends hang out of the lower apertures of the tubes (fig. 1,) *c, d*, while its middle portion forms a noose between the two upper apertures, *a, b*. Both the tubes are to be introduced together down to the root of the polypus. One is then to be kept stationary, while the other is to be conveyed round the polypus to the opposite side of the cannula, which is not moved. The ligature being properly applied in this manner, its ends are to be introduced through the little double cylinder *e*, (fig. 1,) which is only one-third of an inch long, but so wide as to be capable of being pushed over the two cannulæ, *a, b, c, d*, with the fingers, as far as the letter *g*, and with the fork (fig. 3,) quite to the letter *l*, (fig. 2,) or letter *o*, (fig. 4.) Then another double cylinder, through which the ends of the ligature have been introduced, *f*, (fig. 1,) and wide enough to pass over the long double cannula, is to join together their lower ends *m*, (fig. 2.) The ligature is then to be drawn tight, and fastened to the rings.

Herbiniaux has recommended placing pieces of thread, of various colours, on the lower ends of the ligature, with certain interspaces between them, *n, n, n, n*, (fig. 2,) in order to ascertain how thick the root of the polypus is, and how fast the cure proceeds.

This engraving is taken from one in Richter's *Anfangsgr. der Wundarzn.* The ligatures are to be gradually tightened, as they become slack by the destruction of the root of the tumour.

† Loder, *Chirurgisch-Medicinische Beobachtungen*, p. 98. 8vo. Weimar, 1794.

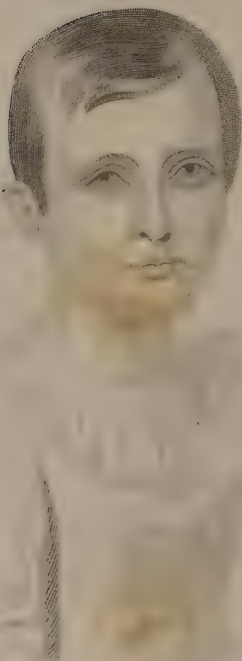


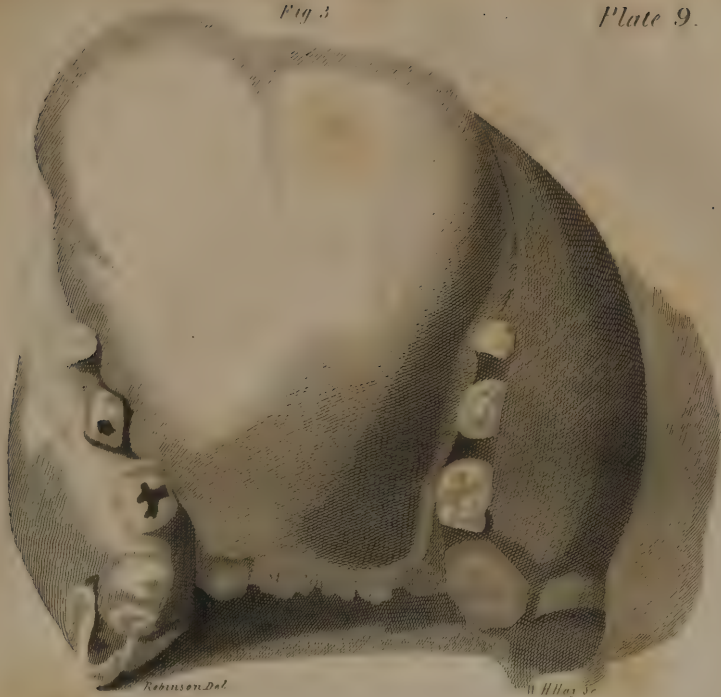


Fig 1



Fig 2.





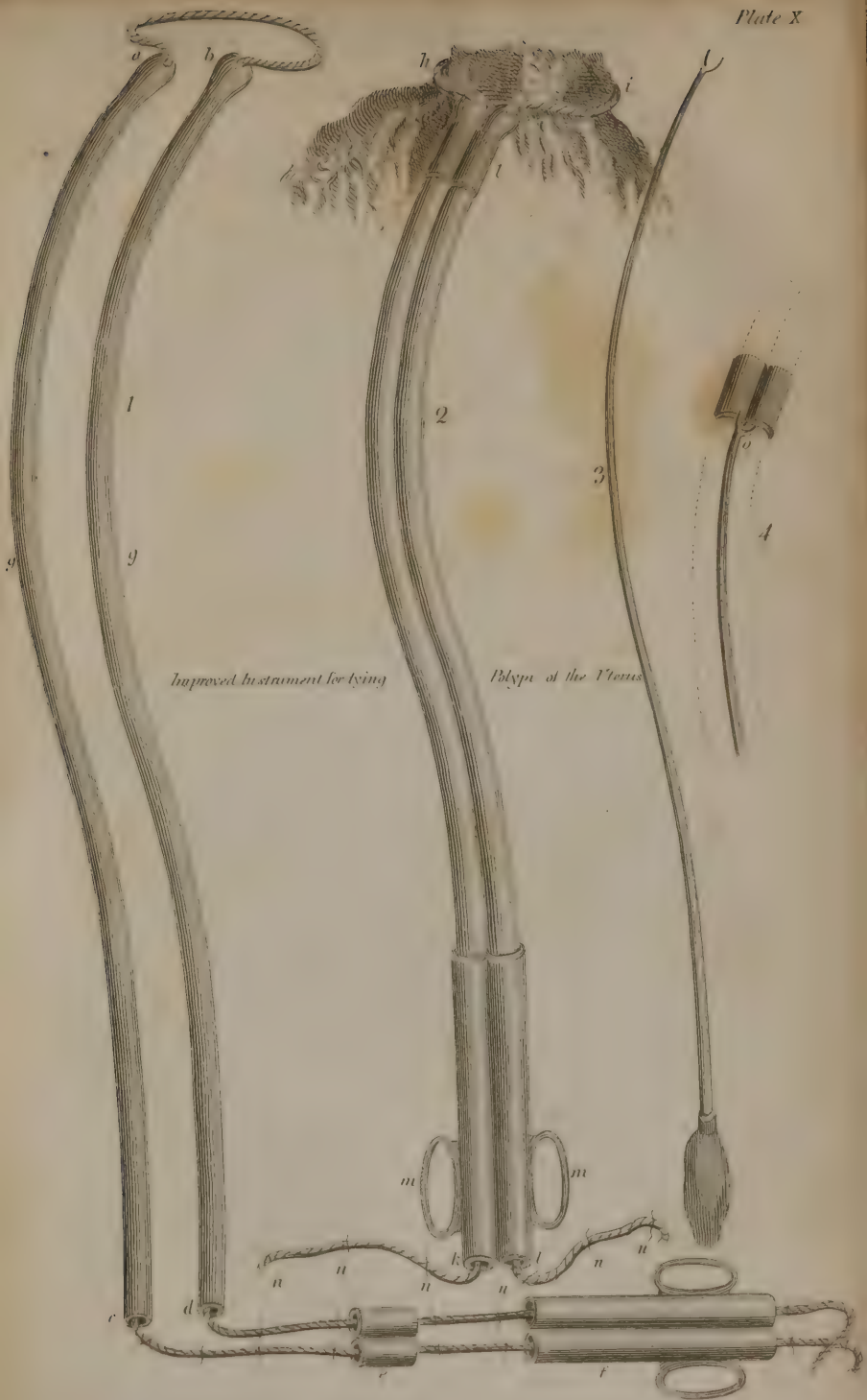
*Fig.1. is a copy of Robinsons Sketch of D.<sup>r</sup> McLellan's patient before the Operation.*

*Fig.2. is a copy of the same taken four Months after the Operation.*

*Fig.3. is a correct Sketch from the tumour now in the museum of Jefferson College.*









of this viscus. In order to relieve, as speedily as possible, the great pain and danger of this accident, the surgeon must tie the root of the polypus, as soon and as firmly as he can, and then amputate the tumour below the ligature. The uterus is to be immediately afterwards reduced. This is almost the only instance, in which a cutting instrument can be employed with advantage in the present disease.\*

Fleshy excrescences sometimes grow in the vagina, some of which have a broad, and others a thin basis. The last merit the appellation of polypi, and may be tied by means of a double cannula, when situated deeply, and, with the hand, when they are near the mouth of the vagina.

## CHAPTER LVIII.

### LITHOTOMY.

A STONE in the bladder is usually attended with the following symptoms: frequent inclination to make water; acute pain in the glans penis and extremity of the urethra, relieved by pressure of the parts, and pinching and drawing the prepuce; a

\* { About three years ago a case of this kind occurred to my brother, Dr. George M'Clellan, in consultation with Dr. Mulford of New Jersey. The patient had laboured under the symptoms of pregnancy for several years, after which she was delivered, with severe labour pains, of an enormous tumour attached to the inner surface of the fundus of the uterus. The uterus was completely everted and dragged down below the vulva by the weight of the tumour. A copious hemorrhage had recurred from day to day, until several weeks had elapsed, and the patient had become almost exhausted. On examination, it proved very difficult to distinguish between the tumour and the body of the everted organ. On clearing away the coagula, however, the place of attachment was perceived, and the whole of the tumour was cut away with a scalpel. The hemorrhage which followed from two or three vessels was suppressed by touching them with a red hot iron, and the patient recovered soon afterwards. The uterus, however, continued in a prolapsed and everted state, similar to the one figured in Smellie's plates. It must always prove impossible to invert the uterus, or to replace it within the vagina, after any considerable period of time has elapsed between the descent of the tumour and its extirpation. Dr. M'Dowell, of Virginia, has suggested the propriety of everting the uterus by forcibly extracting the tumour, and then amputating below a ligature, as recommended by our author. He has operated in this manner successfully, in a case reported in the last volume of the Medical Recorder. }

circumstance, explaining the elongated state of the foreskin often seen in children afflicted with this disorder. At the period when the last drops of urine are coming away, a violent spasmodic pain is felt in the bladder, owing to the stone being then grasped by it. Children, when suffering severely, cross their legs after expelling the urine, and press upon the organs of generation with considerable force.\* When the patient is discharging his urine in the standing posture, the stream is apt to be suddenly stopped by the calculus falling towards the neck of the bladder, the stream continuing again directly he lays down on his back. The irritation is not confined to the bladder and extremity of the urethra, but generally extends to the rectum, occasioning frequent desire to go to stool, tenesmus, and very often in children, prolapsus ani. Frequently, when the stone is rough or pointed, or the patient takes exercise, bloody urine is voided, the bladder inflames, and very severe pain, with febrile symptoms, is experienced. As the disorder continues, the bladder becomes more and more irritable, and the urine generally has a white, slimy, gritty sediment. The fits of pain in the hypogastric region increase both in their severity and frequency. The bladder, being subjected to repeated inflammations, at length becomes enormously thickened, its natural dilatability being lost, and its cavity rendered very diminutive. In very bad cases, its mucous coat ulcerates. The kidneys are not unfrequently diseased; one being sometimes much enlarged, and the other wasted away. The ureters are often dilated, so as to form, as it were, pouches for the reception of the urine, which now can hardly be contained in the bladder at all. In the worst stage, the patients are much emaciated, and sometimes die of hectic complaints.

An enlarged prostate gland is attended with symptoms resembling those of stone; but, with this difference, that the motion of a coach, or horse, does not increase the grievance, when the prostate is affected; while, in cases of stone, it does so in an intolerable degree. In the latter disorder, the paroxysms of pain come on at intervals, whereas the pain from a diseased prostate gland is neither so unequal, nor so acute.

Although the foregoing symptoms, particularly when they all occur, make it highly probable, that the bladder contains a stone, they cannot be depended upon. Patients have often been known to have a calculus in the bladder, without experiencing any remarkable inconvenience; while others, who apparently suffered the usual grievances of that complaint, were found in the end never to have had a stone, their afflictions having pro-

\* Sir A. Cooper. Lectures, vol. ii. p. 228.



ceeded from quite another disease, as, for instance, a scirrhus induration of the bladder and neighbouring parts.\*

Since, therefore, the symptoms of stone in the bladder bear a strong resemblance to those of various other diseases, no surgeon of ordinary prudence ever ventures to offer a decided opinion on the case, before he has introduced a metallic instrument into the cavity of that organ, and actually touched the stone itself. Neither will he affirm, that there is no stone, because he cannot feel it in his first examination. One of the most experienced surgeons that ever lived, says, "I have myself sounded, and not detected a stone at one time, which I have afterwards felt. I have sounded, and not discovered a stone, which another surgeon has afterwards perceived. I cut a patient, and extracted thirty-seven stones from his bladder, who had been sounded, and declared not to have a stone."†

#### OF SOUNDING, OR SEARCHING FOR THE STONE.

The instrument, expressly calculated for this purpose, is denominated a sound, which is not hollow like a catheter, but solid, and made of the best steel. As a stone is generally carried by its own weight to the lowest part of the bladder, the sound is less curved, and somewhat longer, than a catheter, in order that it may reach behind and below the neck of that viscus. Being only a particular kind of probe, the chief use of which is to convey information through the medium of the organ of touch, its handle should be highly polished, so that as many points of it may be in contact with the fingers as possible.

The mode of introducing a sound is the same as that of passing a silver catheter; a subject described in the chapter on retention of urine.

When its extremity is in the bladder, it is at first to be inclined downwards, for the purpose of ascertaining whether the stone occupies its most frequent situation beneath the convexity of the instrument. If the calculus cannot be felt in this direction, the end of the sound may be gently turned, first to one side and then the other; and, in the event of the calculus not being now touched, the handle of the instrument is to be depressed, and its extremity inclined upwards and forwards, in order to learn whether the foreign body may not lie more towards the fundus of the bladder. Frequently, the stone cannot be felt before the whole of the urine has been voided, and the bladder is contracted; and sometimes the sound cannot be made to strike the calculus, unless this body be first raised up by a

\* Desault, *Journal de Chirurgie*, t. ii.

† Sir Astley Cooper's *Lectures*, vol. ii. p. 248.

finger passed into the rectum, in doing which, the surgeon may occasionally feel the stone, if it be large, through the intervening coats of the bowel and bladder. As, however, this method is seldom requisite, except when the calculus is smallish, the practitioner must not always expect to feel it with his finger through the bowel; nor is it a matter of any practical importance, because the information, thus obtained, is more liable to be fallacious, than what the sound affords, and, if the stone cannot be felt with this instrument, any kind of feel communicated to the finger within the rectum, would not warrant the making of an incision into the bladder.

When the stone is smallish, and lies on one side of the cervix of the bladder, it may not admit of being readily hit with the sound. Also, when from repeated attacks of inflammation, hardened folds, or, from other causes, distinct cysts have been formed within the bladder, the calculus sometimes lies within a depression, or cavity, and cannot be felt with the instrument. Under such circumstances, before the sound is introduced, the patient should hold his water, until the bladder is quite full, and, if possible, until it is so distended as to efface, or diminish its preternatural excavations. Then the patient should stand up, and make water with his body inclined forwards, whereby the calculus will be carried towards the neck of the bladder, and admit of being struck with the instrument.\* Whenever the surgeon cannot readily touch the stone, the patient is to be sounded in different attitudes.

In sounding, how possible is it to mistake a thickened, indurated bladder, for a stone in that organ, may be well conceived, when it is considered, that Cheselden, with all his judgment and experience, actually cut no less than three patients, none of whom had any stone in the bladder at the time of the operation. On the other hand, the case of La Peyronie, exemplifies most convincingly the possibility of failing to discover a stone even of considerable size, though the sound be repeatedly passed.

There are two methods of treating calculous patients, generally considered by writers; one is that of attempting to dissolve the stone, or, at least, palliate the symptoms, by medicines; the other aims at its removal from the bladder by a surgical operation. In women, the latter object may often be performed by dilating the meatus urinarius, without using any cutting instrument;† but, in the male sex, the great length, nar-

\* Richter, Anfangsgr. b. vii. p. 103.

† Notwithstanding the many respectable advocates for this practice, it should be known, that there are some men of considerable eminence who object to it, as being more tedious and painful, and more likely to be followed by an incontinence of urine, than the use of a cutting instrument. Of

row diameter, winding course, and considerable irritability, of the urethra, make the extraction of calculi through it, and even the getting hold of them in the bladder with any instrument introduced through the passage, so difficult, that, except when the stone is small, and has been carried by the urine into the urethra, lithotomy has generally been deemed indispensably necessary. It is to be hoped, however, that the success which Sir Astley Cooper, Mr. Brodie, and others, have had in extracting calculi from the bladder with the urethral forceps constructed by Mr. Weiss, and the efficiency, with which the lithonriptor of M. Civiale has been sometimes employed for reducing larger stones to small particles, capable of discharge with the urine, will make a due impression on every practitioner, desirous of lessening the frequency of one of the most painful and fatal operations in surgery.

Though the calculus may have been felt with a sound, at some period or another previously to the time fixed upon for the operation, it is an established maxim in surgery, *never to perform lithotomy, unless the stone can be plainly struck with a sound, or staff, immediately before the operation.* A man may have a stone in the bladder to-day, and the surgeon may strike it so manifestly with the sound, as to make the circumstance perceptible to the ears of the by-standers, as well as to his own fingers; but to-morrow, the stone may protrude between the fasciculi of the muscular fibres of the bladder, carrying along with it a pouch, formed by the lining of this viscus, and, in this circumstance, the stone is no longer in the cavity of the bladder; consequently it can neither be felt by sounding, nor extracted by the operation of lithotomy.

#### OPERATION.

As one of the principal dangers of lithotomy is inflammation of the bladder and peritoneum, I think the common principles of surgery teach us, that it must be a matter of prudence to remove, if possible, beforehand, any state of the constitution, known to promote the access of inflammation. A low regimen, for a few days previously to the operation, and a dose or two of salts, are generally advisable. A plethoric subject might even be bled, if not before, at all events, immediately after the operation.\* A few hours before the patient is cut, the rectum should be emptied with a clyster, as its distention would

this sentiment is the experienced Klein, who has tried both methods, and in 1816 had cut for the stone 79 patients. See *Practische Ansichten der bedeutendsten Chirurgischen Operationen, auf eigene Erfahrungen gegründet von D. C. Klein, p. 21. 2tes Heft. 4to. Stuttgart, 1816.*

\* The objection to bleeding previously to lithotomy is, that the patient sometimes loses a considerable quantity of blood in the operation itself.

expose it to injury. Whether any good results from giving a dose of opium, a little while before the operation, I cannot say, as it is a practice which does not prevail in England. Klein speaks favourably of it, and says, he never omits it, either when lithotomy, or any other considerable operation, is to be done. The patient wishes for the medicine himself; it lessens pain; and it facilitates the introduction of the sound.\*

It is generally considered advantageous to let the bladder be somewhat distended with urine when the patient is cut, and hence, he is usually directed to avoid making water for an hour or two before the operation. This advice I consider well founded, particularly when a gorget is to be thrust into the bladder, which, in an empty state, must be more liable to be wounded at its posterior part; but, in operating with a knife, whether this organ contain urine or not, cannot be a matter of importance, unless the escape of the urine, when the instrument enters the bladder, is to be considered as useful information. Klein, who is in the habit of using a common scalpel, says, he never gives himself any concern about the bladder being empty or not.†

The patient should be placed upon a flat surface, where it is much easier to introduce an instrument in the direction of the axis of the pelvis, than when the table slopes, the posture of the patient then making the operator liable to cut too low, and endanger the rectum. By laying the patient on a flat table, he is prevented from overlooking the operator, and terrifying himself with the sight of blood and instruments. When the patient is put on a sloping surface, the operator must kneel down to gain the advantages, which he fully has sitting down at his ease, before a table that has a straight even surface.‡ The table should be high enough to bring the perinæum on a level with the surgeon's breast. The buttocks should be somewhat more raised than the abdomen; the patient lie upon pillows conveniently placed; and the nates project rather beyond the edge of the table.§

A staff is then to be introduced into the bladder. Two strong garters or ligatures, each about two yards long, are then to be doubled, and placed by means of a noose round the patient's wrists, who is next to take hold of the outside of his feet with his hands, the fingers being applied to the soles. The two ends of the ligature are then to be carried in opposite directions

\* Klein, *Chirurgische Bemerkungen*, p. 28.

† See Klein's *Chirurgische Bemerkungen*, p. 26.

‡ Ibid. p. 23.

§ C. J. M. Langenbeck über eine einfache und sichere Methode des Steinschnittes mit einer Vorrede von Dr. J. B. Siebold, p. 44. Würzburg, 1802.



round the ankle, over the back of the hand, and under the foot, when they may be tied in a bow. The hands and feet being thus securely connected together, the knees and feet are to be supported, kept steady, and held apart by the assistants. Binding the patient in the foregoing way is rather an uncouth proceeding; but, as much danger would result from the patient's moving about in particular stages of the operation, all the most experienced surgeons deem it a matter of necessity.

In arranging the posture of the patient, the chief objects to be attended to are, first, to let the buttocks be exactly even; to take care that neither of the assistants draw the thighs too much towards his own side; and that the parts, situated between the raphe of the perinæum and the ascending ramus of the ischium, be stretched, in which condition, the requisite incisions can be performed with more facility.\*

The staff should be introduced before the patient's hands and feet are bound together; first, because, if the calculus cannot be felt with this instrument, (which, being now used for the sound, saves the patient the pain of a double introduction through the urethra,) it will not be necessary to tie up the patient at all, as the operation must not be attempted; secondly, because, while the patient is unbound, the instrument is more easy of introduction, and in searching for the stone, a change of posture is often necessary.

A curved director, the groove of which serves to guide a cutting instrument into the bladder, is an exact definition of a staff. It is shaped like a sound, or catheter, so that it may pass through the whole of the urethra; but it is frequently rather more curved than those instruments. Its handle, instead of being smooth, like that of a sound, is generally rough, in order that it may be held with greater steadiness. Two advantages are generally supposed to arise from its extremity being more curved than the end of a sound, or common silver catheter; viz. its convexity is more plainly distinguishable in the perinæum; and by depressing the handle of the instrument, when the gorget is to be pushed along its groove, the latter part can be more readily made to take a course corresponding to the axis of the pelvis. A staff should be long, because the greatest mischief would happen if the instrument were not to extend fairly into the bladder, at the moment of employing the gorget. The termination of the groove should always be closed; for, I presume, no lithotomist, whatever may be his kind of gorget, can ever intend its beak, when past to the furthest degree, to quit the groove of the staff.

\* *Langenbeck über eine einfache und sichere Methode des Steinschnittes, &c. p. 12.*

The groove should always be deep and broad; and the instrument be of largish diameter; for, the wider it is, the more easily it can be felt in the perinæum, the more distended the membranous part of the urethra becomes, and the more regular the incision in it is likely to be made.

Though a staff should be more curved than a sound, it need not be immoderately bent, for the sake of rendering its convexity very prominent in the perinæum, because the bones are a sufficient guide to the right place of the first incision. A staff, says Langenbeck, which is much bent, is difficult to introduce; while one less curved, may always be felt plainly enough in the perinæum.\* That the instrument is fairly in the bladder, may be known by its handle sinking towards the ground, without the least impediment.

In the first stage of the operation, the staff is to be held by an assistant, who also raises the scrotum with his left hand, so that the surgeon may have a complete view of the perinæum. Some operators are anxious, that the convexity of the instrument should project distinctly in the perinæum, for which purpose the assistant is usually desired to hold the handle perpendicularly to the patient's trunk, and to propel the whole staff gently towards the part, where the first incision is to be made into it. The generality of surgeons, who attach much importance to this prejection of the convexity of the staff in the perinæum, direct the instrument to be held straight, that is to say, with the handle neither inclined to the right nor left. Other operators, however, take a different mode of determining the situation for the first incision, as will be hereafter explained, and prefer fixing the position of the staff, not with any view of making it project in the perinæum, but on the following principles, supposing the operation is to be completed with a scalpel.

1. After the membranous portion of the urethra has been opened, the incision should be made laterally through the prostate gland.

2. The vesiculæ seminales should be avoided.

3. The rectum is closely attached to the prostate gland by means of cellular substance.

When these things are considered, says Langenbeck, it must be evident how much will depend upon the position of the staff, and a right judgment may be formed of the manner in which it ought to be held.

1. The handle should be inclined towards the patient's right thigh; a method preferred by Cheselden.

2. At the same time, the assistant ought to turn forwards

\* Ueber eine einfache und sichere Methode des Steinschnittes, &c.  
p. 42.

that edge of the handle which faced the left thigh. By this manœuvre, the end of the instrument in the bladder will be turned sideways and a little downwards, and there will not be the least risk of wounding either the *caput gallinaginis*, the *vas deferens*, the *vesiculæ seminales*, or the rectum.

3. Lastly; the handle of the staff must be depressed towards the ground, whereby its end will be removed farther from the prostate and neck of the bladder, more deeply into the latter viscus. If the operation is to be completed with a knife, the staff, when put in the foregoing position, is to be committed to the charge of the assistant, who is to hold it so during the rest of the proceedings.\* The difference of Cheselden's mode of holding the staff from Langenbeck's plan was, that the former did not turn the groove so completely to the left as the latter, while the concavity was drawn up close to the os pubis, in order to remove the urethra as far as possible from the rectum. No doubt, Langenbeck's directions are excellent, when the incisions are to be done altogether with a knife; or until the surgeon takes the gorget in his hand. But when the latter instrument is to be introduced with its edge directed obliquely downwards and outwards to the mid-point between the tuberosity of the left ischium and the anus, the beak will certainly pass more securely if the groove of the staff be rather inclined to the right side of the perinæum, by moving its handle at the moment a little towards the left groin, as used to be the custom of Desault.† The common plan of holding the staff quite straight, with its handle perpendicular to the patient's body, and its convexity prominent in the perinæum, may be considered unobjectionable, while the surgeon is making the external incisions, and until he proceeds to lay open the membranous part of the urethra. When this is to be done, the groove of the staff should be turned a little to the left side of the perinæum; and, afterwards, when the prostate gland and neck of the bladder are to be cut with the gorget downwards and outwards, it will unquestionably be safest to incline the handle of the staff a little towards the left groin, while it is also brought forwards. At this period, the staff must be held by the operator himself; for otherwise he loses the advantage of feeling in the best way whether the two instruments are properly in contact—whether the beak of the gorget is passing securely within the groove of the staff. In completing the

\* Langenbeck über eine einfache und sichere Methode des Steinschnittes, &c. p. 47.

† “L'inclinaison légère du cathéter à gauche, à l'instant de l'introduction du gorgeret, donne au chirurgien la facilité de diriger la lame de celui-ci de telle manière, qu'elle se trouve exactement parallèle à l'incision extérieure.” See *Euvres Chir. de Desault*; tom. ii. p. 469.

operation with a knife, however, I believe with Langenbeck, that the assistant ought to hold the staff the whole time, because there is no perilous thrust of the gorget to be encountered, and when once the staff is well placed, the division of the parts can then be most conveniently performed under the guidance of the groove of that instrument, the index-finger of the surgeon's left hand, his own eyes, and his own anatomical knowledge.

The position of the staff having been arranged according as the intention may be to employ a gorget, or not, the surgeon is to sit down in a low chair, and proceed as follows:

1. He is to feel for the arch of the pubes.
2. He is to trace with his finger the descending ramus of the pubes, the ascending ramus, and the tuberosity of the ischium.
3. When he has plainly distinguished these parts, he is to fancy to himself a line, beginning one inch below the arch of the pubes, running down at the distance of a finger-breadth from the rami of the pubes and ischium, and terminating between the anus and tuberosity of the last-mentioned bone. On this line, the surgeon is to make the first incision through the integuments with one sweep of the knife, while doing which, he is to place the fingers of his left hand on the right side of the nates, and make the skin of the perinæum tense with the thumb.\*

In a boy eight years of age, Langenbeck begins the incision one finger-breadth above the anus, and half a finger-breadth from the ascending ramus of the ischium. In an adult, he recommends the cut to begin two finger-breadths above the anus, and to be carried down at half that distance from the ramus of the ischium.† As far as my own judgment extends, the beginning of the incision in a full-grown person should never be more than an inch and a half at most above the anus, as laying open a greater extent of the membranous part of the urethra towards the bulb can have no more effect in facilitating the extraction of a stone from the bladder, than if the whole urethra were divided. When the external incision is made too high up, considerable disadvantage arises; for, when the operator begins in this way, and extends the wound the usual length, and divides with his scalpel the fat, transversales muscles, ligamentous fibres, and membranous part of the urethra, and then with his gorget makes the division of the prostate gland and neck of the bladder, he finds upon attempting to take out the stone, that the external part of the wound is too high up, in regard to the opening in the bladder, and the same impediment to the extraction

\* Langenbeck, vol. cit. p. 49.

† See his *Neue Bibliothek für die Chirurgie und Ophthalmologie*, b. i. p. 437. 12mo. Hanover, 1818.



of the calculus is produced, as if the wound were too small. A free and direct opening for the passage of the stone ought always to be made; the fatal termination of numerous cases being entirely owing to the neglect of this important rule; because when the wound is too small, the greatest difficulty is experienced in getting out the stone, the forceps are introduced again and again, the bladder is seriously bruised and injured, the patient is kept a long time upon the operating table, and, if a further use of the knife be not made, or the stone broken (a very unpleasant circumstance,) the extraction either will not be accomplished at all, or not without violent laceration of parts, which ought to be simply divided.

Having made the necessary division of the integuments, the next object is to dissect through the fat and cellular membrane, cut through the transversales perinæi muscles, and make an opening through the membranous part of the urethra, into the groove of the staff.

In this stage of the operation, the groove of the staff ought to be turned towards the left side of the perinæum, downwards and outwards, and perhaps even somewhat more laterally, when it is intended to complete the opening into the bladder altogether with a knife. The principal things here to be avoided, are, cutting the bulb of the urethra, endangering the arteria profunda penis, and opening the membranous part of that canal too high up. Of course, before the surgeon ventures to cut into the groove of the staff, he ought to feel the edges of the instrument very distinctly with his left forefinger. It is also safest to begin to lay open the membranous part of the urethra at what may be regarded as the anterior point of the opening out of which the stone is to pass, and not further back, towards the prostate gland. As soon as a small incision has been made into the groove of the staff, with the edge of the knife turned upwards and inwards, the operator, guided by the groove and his left forefinger, is to extend the cut back, as far as the prostate gland, through the rest of the membranous part of the urethra, taking care to keep the edge of the scalpel always turned in the same direction upwards and inwards, towards the groove of the staff.

Some operators place the back of the extremity of the knife in the groove of the staff, and then lay open the urethra, as far as the prostate, with the edge directed downwards and outwards. Either of these methods is perfectly safe, provided the staff be sufficiently large, and its groove wide and deep. However, in dissecting down to the membranous part of the urethra, and in laying it open, as well as in cutting deeply towards the prostate, the surgeon must never direct the edge of the knife too much downwards, because he would wound the lower part of

the rectum; and the same caution is still more necessary in dividing the prostate gland.

When the preceding instructions are duly fulfilled, very little remains to be done with the gorget.

Every operator should be particularly careful, that the beak of the gorget is accurately adapted to the groove of the staff. As far as my humble judgment extends, the edge of the gorget ought not to turn upwards, as advised by Mr. Abernethy and Scarpa.\* By cutting in this direction, the pudendal artery must be more apt to be wounded, than when the incision is directed outwards and downwards, towards the mid-point between the anus and the tuberosity of the ischium; because the rami of the ischium, on the inside of which the common pudendal arteries run, converge as they ascend; and, for the same reason, by using a gorget with an edge turned upwards, the wound can hardly be made large enough for the extraction of stones of considerable size. The impossibility also of making, with such an instrument, the incision in the neck of the bladder and prostate gland in the same direction as the oblique external wound, is another weighty objection to it. As Langenbeck correctly remarks, it is difficult to conceive how the pudendal artery can ever escape, when Cline's gorget is employed, the edge of which cuts directly towards that vessel. Fortunately, says he, the artery lies very close to the bone, and under an aponeurosis.† The direction of the edge of the gorget upwards and outwards must be still worse.

When a gorget is made to cut outwards and downwards in the manner above recommended, a longer cutting edge can be employed, without any risk of wounding the pudendal artery, so that a sufficient opening may be made in the bladder, for the easy passage of the stone, and one of the principal objections to gorgets in general is materially lessened.‡

Having made a free opening into the urethra, as low down as can be conveniently done, the operator is to place the beak of the gorget in the groove of the staff, and, being sure that this is accomplished, he is to take hold of the handle of the latter instrument with his left hand, while with his right, he holds the beak of the gorget carefully applied to the groove of the staff, along which it is to glide into the bladder. But, before pushing the gorget onward, a most important rule is to be observed; namely, to bring the handle of the staff considerably

\* See his *Memoir on Hawkins's Gorget*, translated by Briggs.

† *Über eine einfache und sichere Methode des Steinschnittes*, p. 67. Klein wounded the pudendal artery, by using Cline's Gorget. See *Chirurgische Bemerkungen*, p. 15.

‡ See NOTE Q.

more forwards, than a perpendicular line to the trunk, and thus to elevate its extremity, by which means the gorget may be introduced, along the groove, nearly in the direction of the axis of the bladder. In fact, it should be introduced, as nearly as the curvature of the staff will admit, in the direction of a line drawn from the os coccygis to the umbilicus, its beak being most carefully kept in the groove. When this plan is followed, it will never wound the rectum, nor insinuate itself into the cellular substance between this intestine and the bladder.

When the gorget has entered the bladder, a circumstance indicated by the discharge of urine from the wound, the staff is to be withdrawn, and a proper pair of forceps passed along the gorget into the bladder, for the purpose of seizing and extracting the stone. Formerly, the forceps used to be made too thick and clumsy, the inside of the blades being frequently furnished with little spikes or teeth, intended to keep the stone from slipping. These were exceedingly objectionable; first, because they often broke the calculus before it was out of the bladder; and, secondly, because those situated towards the back part of the blades, when the stone happened to be grasped there, had the effect of increasing the expansion of the instrument so considerably, that it could not be drawn out.\* The teeth of common stone forceps have also an ill effect in preventing the stone, when it is grasped with its long axis across to the wound, from turning, as the forceps are drawn out, into a better position. However, though teeth are not to be commended, the inside of the blades ought to be somewhat rough.

The surgeon should always be provided with several pairs of forceps, of different sizes. The handles should be two-thirds of their length, and the blades one-third. Some of the blades must be flat, for the extraction of small calculi, or fragments; while the blades of others should be curved, to reach calculi behind the pubes or prostate gland.†

While the operator is passing the forceps along the gorget, the latter instrument must be kept quite motionless, lest its sharp edge do mischief; and immediately the forceps is in the bladder, the cutting gorget is to be withdrawn.‡

The next object is to take hold of the stone with the forceps. The operator should not expand the instrument as soon as it has arrived in the bladder; but he should first make use of it as a kind of probe, for ascertaining the exact situation of the stone. If this be lodged at the lower part of the bladder, just behind its neck, and be distinctly felt below the blades of the

\* Langenbeck über eine einfache und sichere Methode des Steinschnittes, p. 43.

† Sir A. Cooper's Lectures, vol. ii. p. 253.

‡ See NOTE R.

forceps, the forceps may be opened immediately over the stone, and after the blades have been depressed a little, they are to be shut. Certainly, it is much more scientific to imitate Cheselden, and use the forceps, at first, merely to ascertain the position of the stone; for, when this is known, the operator is far more able to grasp the extraneous body, in a skilful manner, than if he were to open the blades of the instrument immediately, without knowing where they ought next to be placed, or when shut. No man can doubt, that the injury which the bladder frequently suffers, from reiterated and awkward movements of the forceps, is not an uncommon cause of a fatal inflammation of this organ, and of the peritoneum.

If the calculus cannot be readily felt, the forceps should not be roughly moved about, so as to bruise the bladder, and put the patient to insufferable agony; but it should be taken out, and the forefinger gently introduced, with which the situation of the calculus may generally be distinctly felt.

When the situation of the calculus has been ascertained, the blades of the forceps are to be separated, and the stone received between them: this must be done with great gentleness. If the extraction be violently resisted, the stone should be quitted, the forceps withdrawn, the position of the stone examined with the finger, and, if necessary, its long axis made to correspond to that of the bladder. Stones are often broken, which might be removed whole, if the surgeon were less violent, and more cautious. The mode of preventing them from being broken, is, after they have been taken hold of, to put the thumb, or finger, between the handles, so as to hinder them from being forcibly closed.\*

When the stone is so large, that, turned in any position, it cannot be extracted from the wound without violence and laceration, the surgeon may either break the stone with Mr. Earle's instrument, or with a strong pair of screw forceps, furnished with teeth for the purpose; or he may enlarge the wound with a common scalpel, or a probe-pointed, curved bistoury, introduced under the guidance of the forefinger of the left hand.

To the employment of the knife in this circumstance, I must express my decided preference; because breaking the stone creates a disagreeable risk of fragments being left behind, and, consequently, of a return of the disorder.

When the stone, however, exceeds certain dimensions, the operator ought rather to break it, than employ unwarrantable force for its extraction.†

\* Sir A. Cooper's Lectures, vol. ii. pp. 254-262.

† When a stone is of enormous size, and evidently cannot be sufficiently broken, without too tedious and irritating a process, I think the high



When this has been done, and as many of the broken pieces have been taken out with small forceps as can be thus removed, the surgeon is to feel with his finger, whether any fragments still remain. If they do so, gentle attempts must be made to extract them with the scoop. Lukewarm water is sometimes injected, with the view of washing them out; but, I believe, Sir Astley Cooper is right in representing the proceeding as one of little utility.\*

The operator ought always to examine a stone, as soon as it is extracted; if it be rough, it is a presumptive sign, that it is the only one; if smooth on one side, and rough on the other, or excavated at any surface, there may probably be other stones. But, in every instance, the forefinger should be introduced, to obtain decisive information on this point; for it would be unpardonable to put the patient to bed, while another stone remains.

Sometimes, a stone cannot be grasped with the forceps, unless it be first raised by the left forefinger, introduced within the rectum.

#### OF COMPLETING THE INCISION INTO THE BLADDER WITH A KNIFE INSTEAD OF A GORGET.

The disastrous accidents, which occasionally result from the employment of gorgets, have induced many judicious surgeons to prefer finishing the operation with a knife, or, at all events, some kind of cutting instrument, not suddenly thrust into the bladder, like a common gorget, with a risk of slipping away from the staff, and doing the most fatal mischief. From mistakes and unskilfulness in this part of the operation, I have known the urethra to be entirely severed from the bladder, and the patient, after suffering excruciating torture upon the operating table, die from the injury done, with the stone unextracted, the bladder not having even been opened. In several examples, I have known the gorget slip between the bladder and rectum, and the patients lose their lives with the stone unremoved. I have seen patients opened after this operation, in whom the gorget had dreadfully injured the opposite side of the bladder. I recollect other cases, in which the gorget slipped between the bladder and pubes, and, of course, the calculus never had an opening made for its extraction. In one or two

operation should be preferred, because, above the os pubis there is much more room for the extraction of a very large calculus, than under the arch of that bone. Let not the inexperienced practitioner fancy, however, that any calculus can be got out above the pubes; for stones have sometimes been so enormously large as to fill the bladder, and not to admit of being taken out, even from the dead subject, without vast difficulty and violence.

\* Lectures, vol. ii. p. 262.

cases, I have known the rectum to be cut, more than the bladder itself. Now, when it is further considered, that besides such mischief, arising from the slipping or unskilful use of a well-made gorget, a broad, badly constructed one may cut the pudendal artery, it must be confessed, that there is great cause for wishing that lithotomy could always be done with an instrument attended with fewer dangers.

According to Klein, than whom few have written more sensibly on lithotomy, that method of operating must be accounted the most advantageous, in which the surgeon is best enabled to make with certainty the right kind of incision, that is to say, in which the opening in the bladder may be made larger, or smaller, as may be judged requisite; in which, also, the fewest instruments are needed; the least irritation produced; the operation most expeditiously done; and in which the instruments will serve for every age and sex, and for all cases, whether the stone be large or small. A common scalpel is the only instrument possessing such recommendations, and with it, the operation can be perfectly executed. Unfortunately, however, instead of laudable endeavours to bring the knife more generally into use, we see every now and then new gorgets invented, as if these thoroughly useless instruments were really necessary.

The gorget, says Klein, as a conductor for the forceps, is entirely unnecessary; for, how repeatedly do we see the latter instrument introduced in the course of an operation, under the guidance of the finger, without any assistance from a gorget? And, as the latter means is sometimes dispensed with, as a conductor, why should it not always be so? But, as a cutting instrument, it is not only not essential, but decidedly objectionable; for, in every instance, it makes the wound of a determinate size, whatever be the dimensions of the stone.

From the explanation already given of lithotomy with a gorget, the reader will understand how to proceed as far as the period, when the side of the prostate gland and the neck of the bladder are the only parts remaining to be divided; for, until this moment, every thing is done nearly in the same way, whether a gorget is to be afterwards employed, or not.

Cheselden, after cutting the fat rather deeply, especially near the rectum, used to put his left forefinger into the wound, and keep it there till the internal incision was quite finished; first, to direct the point of his knife into the groove of the staff, which he now felt with the end of his finger; and, secondly, to hold down the rectum, and keep it from being wounded. The internal incision was then made by cutting into the groove of the staff, through the side of the bladder, immediately above the prostate, and afterwards continuing the point of the knife

along the same groove downwards and forwards, so as to divide the portion of the sphincter lying upon the prostate, and then the outside of the gland itself obliquely, in the direction of the urethra within it, the requisite division of which, however, was made the last part of the business.

Mr. C. Bell imitates one of Cheselden's earliest methods; cutting first into the staff, and then running the knife along the groove of the staff, into the bladder, followed by the left forefinger. This is to remain, the knife to be withdrawn, and the forceps introduced under the direction of the finger. The chief peculiarity in the method, is the use of a staff, grooved on the right side.\*

Klein considers it immaterial, whether the groove of the staff be turned obliquely downwards, or to the left: as far as his own experience goes, the knife is less apt to slip when the groove is downwards, which may then be more readily found.

Klein has given the most exact account, which I have been able to find, of the method of operating with a knife. The following are the instructions delivered by him:

After the rectum has been emptied with a clyster, a dose of opium administered, the patient properly bound upon the table, and the hair shaven off the perinæum, the staff is to be introduced. The scrotum is to be held up by an assistant, who is to hold the convexity of the staff obliquely towards the left side, and closely pressed against the perinæum.

The operator should be seated, with his breast on a level with the patient's perinæum: he is to notice well the direction of the ascending ramus of the ischium; stretch the perinæum towards the right side with his left hand, and with a longish, convex-edged scalpel, he is to make an incision, three inches long, through the skin and muscles. This cut is to extend from the middle of the perinæum, obliquely towards the left side, between the anus and ischium, running parallel to the ramus of the latter bone, at the distance of one finger-breadth from it. With his left forefinger, the surgeon is now to feel for the groove of the staff, and cut completely through the muscles towards it, making the wound in the same direction as the first incision. He is to cut obliquely upwards towards the symphysis of the pubes; not in the middle of the external wound, but at its upper angle. By this second cut, he will either get into the groove of the staff, or, at all events, be enabled to feel it very plainly, in which case, the point of the knife, guided by the finger, is now to be pushed into the groove, directly behind the symphysis of the pubes,† through the left side of the urethra,

\* See C. Bell's *Operative Surgery*, vol. i.

† Klein cuts higher up than Langenbeck directs, or than appears to me

and the knife is then to be carried a little way forwards along the groove, in order to divide some of the membranous part of the urethra. By cutting precisely in this manner, it will be impossible to wound either the rectum, or the bulb of the urethra: the first part never, because the incision is directed upwards, not downwards; and with regard to the last, it is not at all endangered, as it is situated exactly under the symphysis of the pubes, and anterior to the incision in the urethra. Besides, it may always be pressed with the finger to one side.\*

The knife being placed in the groove of the staff, the surgeon is to take the latter instrument from the assistant, incline its handle somewhat towards himself, so as to elevate its point, while he presses its concavity close up against the ossa pubis, partly to increase the tension of the urethra, and partly to let the instrument rest upon a fixed point, the grove still continuing to be directed to the left side.

Now the knife is to divide the membranous part of the urethra, and the prostate gland; which is the part of the operation requiring the greatest care. *In every case, says Klein, the blade must be so directed as to bring its surface in a parallel line to the ascending ramus of the ischium, with the edge towards the lower angle of the external wound, and never towards the ischium.* It is next to be considered whether, on account of the magnitude of the stone, or the patient's age, the incision should be large or small. In the latter case, the back of the scalpel must be kept close in the groove of the staff; but, in the former, it must be more or less separated from the groove, according to the extent to be given to the incision. The distance can only be well calculated by practice; but, a failure will never attend even the first trial; for, when any uncertainty prevails, it is always best to keep the back of the knife nearer the groove, and make a smaller cut, which, if necessary, may afterwards be enlarged.

Until now the knife is to be held like a pen, and the cut through the prostate gland might be performed in the same manner; but as its division requires more force than the parts previously cut, Klein thinks it better to grasp the handle of the

advantageous. How far the highest part of the incision ought to be below the arch of the pubes, I have explained in a foregoing page.

\* Klein thought an injury of the bulb of the urethra a matter of no importance, and in itself I believe it is so; but, by cutting so high up as to expose it at all to be wounded, is disadvantageous on other accounts. First, because the external wound is then too high up, in relation to the opening, through which the calculus must pass out of the bladder. Secondly, because laying open all the membranous parts of the urethra is completely unnecessary. And, lastly, because cutting about the bulb, as Langenbeck has correctly pointed out, endangers the arteria profunda penis.



knife with the whole hand. The scalpel being now securely held in the right direction, and the staff firmly kept in the proper position with the left hand, the first instrument is to be boldly and quickly carried straight along the groove of the latter. The point of the knife, which is never to quit the groove, is to be pushed on, either until it touches the closed part of the staff, or the want of resistance denotes its being within the bladder. When raising the handle of the knife in withdrawing it, Klein always takes that opportunity of dilating the incision in the bladder from within outwards, and the whole wound now has, instead of a triangular, a quadrangular form. "I thus (says he) combine the effect of a gorget with that of the bistoire cachée. I open the bladder, as the knife is pushed on, and enlarge the opening as the instrument is withdrawn."\*

The knife and staff having been withdrawn, the left forefinger is to be introduced into the bladder, in order to feel whether the opening is large enough; *and it should always be large enough to let the stone easily pass out, without any violent pulling, which must inevitably occasion a serious degree of contusion.* The more readily the stone comes out, the more speedy is the cure. Le Cat, and Scarpa,† have written about the advantages of a small incision, the dangers of a free opening, and the little harm of dilatation. But, says Klein, "I entertain quite the opposite opinion, and consider a free incision as most likely to bring about an expeditious and a perfect cure." By following the above directions, the incision will never be made too large. Neither will the pudendal artery, nor any other part which ought to be avoided, be injured, as the edge of the knife never cuts towards the ischium, but at a certain distance from, and in a parallel line to it.

Should the wound be found large enough for the extraction of the stone, the forceps is to be introduced under the guidance of the finger, and the calculus taken out.

But, if the opening appear too small, (a circumstance often first observable on attempting to draw out the stone,) the left forefinger is to be passed into the bladder, and (under its direction, and with the point not projecting beyond it) the knife is to be again carried into the bladder, in its former position. The prostate gland is then to be completely divided, care being taken always to cut obliquely downwards to the left. If requisite, the incision is also to be carried on through a part of the bladder itself, in doing which, the operator must cut only with

\* Practische Ansichten der bedeutendsten Chirurgischen Operationen auf eigene Erfahrungen gegründet von D. C. Klein, p. 23. 4to. Stuttgart, 1816.

† Memoir on Hawkins's Cutting Gorget.

the further part of the knife, pressed on with the finger. Thus, the incision may be made as large as necessary, without any risk, and the rectum can never be hurt with the flat surface of the blade.

In a work of more recent date, Klein lays down, as the basis of his method, the necessity of always dividing not only the prostate gland completely through, but also a portion of the bladder itself. Upon this basis (says he), rests the success of my operations, and hence I invariably make it a rule, rather to make the incision too large than too small, and never to dilate it with any blunt instrument, when it happens to be too diminutive, but to enlarge it with a knife, introduced, if necessary, several times.\*

The next thing is to search for the stone with the forceps, the blades of which are to be oiled, and introduced into the bladder in the axis of the pelvis. Klein says, he has often got in the forceps, without any preliminary introduction of the finger. The instrument should be passed in the direction of the wound, with its sides turned towards the angles of the incision. The stone is now to be felt for, the position of which has in general been already ascertained by the finger, and it is commonly soon discovered, when the forceps is cautiously moved about in various directions. An endeavour is to be made to extract it by the smallest diameter, in regulating which object the forefinger will be of assistance. The extraction should be done very slowly, and always in the direction downwards, outwards, and forwards, according to the axis of the wound. The stone should also be drawn out with a wriggling motion, between the lips of the wound, and not towards its angles, where the parts are less yielding, and an unnecessary degree of contusion would be produced.

In general, says Klein, when the wound is properly made, the stone may be taken out with great facility. If very large stones be met with, much turning of them, and a great deal of trouble, are sometimes necessary.

Another motive, judiciously urged by Klein, for making a free opening, is to extract soft stones unbroken, which is much better, than taking them out piecemeal, and repeatedly introducing instruments. He owns, that it is generally difficult to ascertain beforehand the soft consistence of a stone; yet, says he, when much sand-like matter is discharged with the urine, and the stone, when hit with a metallic instrument, makes no very distinct sound, a suspicion of its softness may be entertained, and in this case, it is most prudent not only to make a

\* *Practische Ansichten der bedeutendsten Chirurgischen Operationen*  
p. 27.

large opening, but to avoid grasping the calculus too firmly with the forceps.

However, if the stone break, the largest fragments must be taken away partly with the finger, partly with the forceps or scoop, and partly by means of a lukewarm injection. The removal of every small particle, however, Klein considers unnecessary, as it is sure of being voided with the urine in the course of the first few days after the operation, and the repeated introduction of instruments would cause excessive irritation.

As soon as the calculi and fragments have been removed, a point which is to be ascertained with the finger, the patient is to be unbound. Klein lays lint dipped in oil upon the wound, and then a compress, and T bandage. In this country, frequently, no dressings are applied to the wound directly after the operation; but merely a folded napkin, or sheet, is placed under the nates, and changed whenever it becomes wet.\* Klein confines the knees loosely together with a napkin, and the patient lies upon his side with the thighs and knees considerably bent.† Nor does Sir Astley Cooper consider it necessary to keep the patient always on his back, but says, the patient will derive great relief from lying sometimes on his side. The scrotum, he observes, should always be supported with a bandage, so as to hinder it from being irritated by the urine.‡ The first day, Klein lets his patient drink freely of barley-water, and afterwards of lemonade. Sir Astley Cooper also gives his patients at first large quantities of linseed tea, or barley-water with gum acacia in it; and when the danger of inflammation is over, beef-tea, broth, or gruel. Klein gives an opiate, as soon as the patient is put to bed; and on the second day, the bowels are opened, with a clyster, or gentle purgative. Sir Astley Cooper sanctions the exhibition of opium, if the patient be very irritable; but, unless absolutely necessary, dispenses with it, as it is apt to check the action of the bowels. When the wound suppurates, Klein dresses it with dry lint, and never finds any other application requisite, except sometimes a little caustic towards the end of the case.§ In proof of the success of his method, he tells us, that in 1816 he had cut into the bladder seventy-nine times, and not one patient had died, unless where the prostate, bladder, kidneys, or ureters, were diseased. Notwithstanding the free division of the bladder, most of the patients got well in from eight to fourteen days; a few in a month; and one alone was three months in recovering. Though the sphincter of the bladder was divided, no paralysis of it was the result. Except

\* Sir A. Cooper's Lectures, vol. ii. p. 269.

† See NOTE S.

§ Chirurgische Bemerkungen, pp. 37-48.

‡ Vol. cit. pp. 268-270.

when the calculi were large, or something unusual happened, the operation was completed in thirty seconds, or a minute.\* When the wound begins to granulate, Sir Astley Cooper ties the legs together: if this be done too soon after the operation, he says, it hinders the free escape of blood and urine from the wound.†

#### OF LANGENBECK'S LITHOTOMY KNIFE.

Langenbeck adopts many of Klein's sentiments concerning the principles of this operation; but he differs on one point, which is of consequence. He is of opinion, that the wound should be made at once of an adequate size; and not be made at first small, and afterwards enlarged, according to the size of the stone. While Klein thinks almost any scalpel will serve for making an opening into the bladder, and uses himself only a common bistoury, about seven inches in length, Langenbeck prefers a larger and broader knife, the point of which admits of having a sliding guard pushed over it, at the period when it is to be introduced along the groove of the staff. He thinks the edge ought to be convex; for if the knife be straight, the incision, if made from without inwards, will be too small; or, this inconvenience can only be in some measure hindered by making the lithotomy knife form a considerable angle with the staff; that is to say, by letting merely the point of the knife touch the latter instrument, while its back is considerably separated. When the angle between the staff and the knife is great, the broad part of the blade, Langenbeck conceives, is carried too near the pudendal artery. A convex-edged knife always forms a larger incision, without any occasion for making so considerable an angle.

In cutting into the groove of the staff, Langenbeck opens the membranous part of the urethra at some distance behind the bulb: he does not cut straight forwards, or inwards, with respect to the patient; but depresses the handle of the knife, and directs the point obliquely upwards towards the axis of the pubes. How necessary here a good point is for this manœuvre, must be sufficiently obvious; for the operator cannot go on with the incision, until he has first made a puncture.

Hence, Langenbeck's lithotomy knife is constructed with a sliding guard for the point. The guard, he says, is of essential use in facilitating the conveyance of the knife along the groove of the staff, because, if an attempt be made to push the knife forwards on its point, it will pass along with great difficulty, as the point will hitch in the groove. This will happen in the

\* *Practische Ansichten der bedeutendsten Operationen*, pp. 28, 29.

† *Lectures*, vol. ii. p. 269.



greatest degree, when the staff has been used in several previous operations. But, a lithotomy knife, the point of which is guarded by a small button, slips very readily along the groove.

Langenbeck considers the sliding guard\* the more essential, as the knife must be pressed firmly into the groove of the staff; and, without such a contrivance, its point would be apt to break, when it reached the termination of the groove. He recommends the handle to be long, so that the knife may be easily pushed as far as the end of the staff.

#### OF WOUNDS OF THE RECTUM.

Unless the operator cut very carelessly, and turn the edge of the knife directly downwards, instead of obliquely sideways, the rectum cannot be injured. With a gorget, however, there is really more danger of such an accident, when the instrument slips out of the groove of the staff. Also, when the rectum is distended with feces, it is more exposed to injury; but, why should the surgeon ever operate, without having previously emptied that intestine?† But, if the accident were to happen, I think with Klein, that Desault's advice immediately to divide the rest of the gut down to the anus is entirely erroneous, as numerous instances have proved, that the wound may heal up of itself very well. I once saw a case, in which the rectum was wounded with a lithotomy knife; but the cut in the bowel healed, and never gave any trouble.

#### OF WOUNDS OF THE PUDENDAL ARTERY.

No doubt, some of the profuse bleedings, which have taken place in lithotomy, have not proceeded from the pudendal artery itself, but either from the arteria profunda penis, when the incision was made too high up, or, in other cases, from the trunk of the perineal artery. I am surprised, however, that M. Roux‡ should assert, that, in directing the incision too far laterally, there is no risk at all of wounding the pudendal artery. This is an observation which is entirely erroneous, and might encourage the admirers of broad, long-edged gorgets, to persevere with their instruments, until they had learned from experience,

\* The construction of Langenbeck's knife, and the nature of the sliding guard for the point, when this is to be pressed into the groove of the staff, will be sufficiently intelligible by a reference to plate XII. figs. 3 and 4. The instrument there represented is calculated for an adult; a smaller one was used on a boy eight years old. See his *Neue Bibliothek für die Chirurgie*, b. i. p. 431.

† *Chir. Bemerkungen*, p. 6.

‡ *Relation d'un Voyage fait à Londres en 1814; ou Parallèle de la Chirurgie Angloise avec la Chirurgie Francoise*, p. 322. 8vo. Lond. 1815.

that lithotomy can never be done with safety, unless the incision be made, not only of sufficient size, but in a proper direction. Klein informs us, that he has twice had the ill luck to wound the trunk of the pudendal artery; the first instance was in a child four years of age; the hemorrhage was suppressed by introducing into the wound a piece of sponge, which was removed on the fifth day; the part was healed in a fortnight, but, for nine weeks, an incontinence of urine continued, which was ascribed to the pressure of the sponge.\* The second case happened in a patient twenty-six years of age, from cutting too much sideways with Cline's gorget. After the extraction of the calculus, the wound was distended with a linen tent and a piece of sponge; and the patient kept quiet on the operating-table twenty-four hours, during all which time the assistants relieved each other alternately in making pressure on the wound. The patient lost four pounds of blood in the operation; his pulse was exceedingly feeble, and rapid; his countenance cadaverously pale; and his strength so much reduced, that the greatest fears were entertained for his life.†

Surgeons should never try to tie the trunk of the pudendal artery, when it happens to be wounded, but remove the calculus, and then fill the wound with sponge.‡ Even if it were practicable to tie this artery, it would not be advisable, previously to the extraction of the stone, the passage of which outwards would inevitably force the ligature off the vessel.§||

#### OF INFLAMMATION WITHIN THE ABDOMEN AFTER THE OPERATION.

The majority of patients, free from visceral disease previously to the operation, who die in consequence of lithotomy, perish of peritoneal inflammation. Hence, on the occurrence of any tenderness, pain, and tension over the abdomen, with great restlessness, thirst, heat of the skin, and a small quick pulse, copious venesection should be put in practice. At the same

\* *Chirurgische Bemerkungen*, p. 11.

† { Franco invented the practice of suppressing hemorrhage from the wound in this operation, by inserting a cannula into the bladder, and stuffing charpie around it, so as to fill up the wound and make compression upon the divided vessels. The same practice was afterwards followed by Foubert, and recommended by most of the writers of that day. It has been claimed, however, as a new improvement, by a distinguished surgeon in this country, and attributed to him in all the writings upon lithotomy, which have been published on this side of the Atlantic. }

‡ A cannula should be passed through the sponge, for the easy evacuation of the urine. See C. J. M. Langenbeck über eine einfache und sichere Methode des Steinschnittes, p. 58, 4to. Würzburg, 1802.

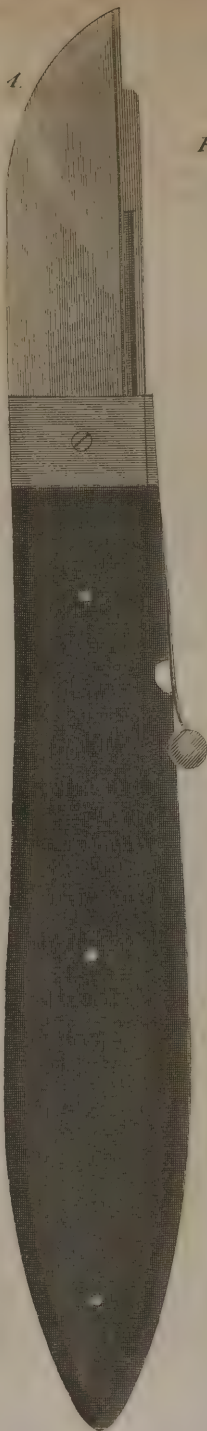
§ Klein, op. cit. pp. 12-21.

|| See NOTE T.

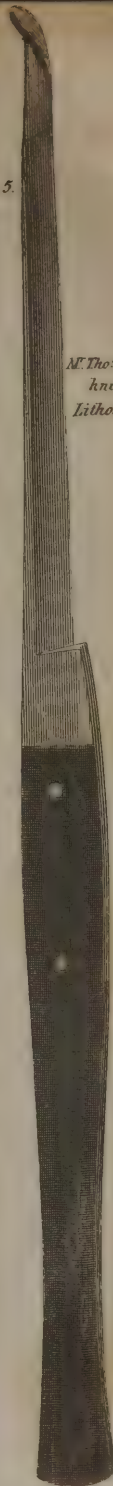
*Fig. 3.*



*Fig. 4.*



*Fig. 5.*

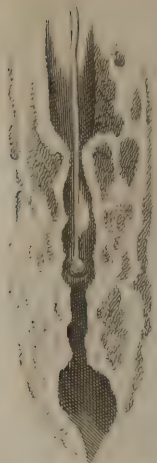


*Fig. 6.*



*M. Tho<sup>s</sup> Blizard's  
knife for  
Lithotomy.*

*Fig. 1.*



*M<sup>r</sup> Bell's balls for  
examining Strictures.*

*Fig. 2.*







time, eight or ten leeches should be applied to the hypogastric region. Much benefit will also be derived from the warm bath, fomentations, blisters, the exhibition of *oleum ricini*, and emollient clysters.

I have seen several old subjects die of the irritation of a diseased, thickened state of the bladder, continuing after the stone had been extracted. They had not the acute symptoms, the inflammatory fever, the general tenderness, and tension of the abdomen, as in cases of peritonitis; but they referred their uneasiness to the lower part of the pelvis; and, instead of dying in the course of two or three days, as those usually do who perish of peritoneal inflammation, they, for the most part, lingered for two or three weeks. In these cases, opiate clysters, and blistering the hypogastric region, are proper.

In some instances of this kind, collections of matter form in the vicinity of the neck of the bladder.\* Gangrene of the scrotum, from the violence used in the extraction of the stone, and a large extravasation of urine in the cellular membrane, are most likely to be avoided by making a free and direct opening into the bladder, not too high up towards the scrotum.††

\* In Italy, Nannoni and Flajani have for some years past performed lithotomy nearly in the same manner as Klein. In England, the knife has been preferred to the gorget by a large number of the best modern surgeons, some of whom, however, appear yet to be reluctant to abandon gorgets altogether. Mr. T. Blizard employed a particular knife for lithotomy. (See plate XII. figs. 5 and 6.) So did the late Mr. Gibson, whose instrument may be seen at any of the shops. Sir A. Cooper has sometimes operated with a convex-edged dissecting knife, made with a beak, by means of which it admits of being guided along the groove of the staff. Every knife for lithotomy should be, with the handle, seven or eight inches long; for, otherwise, it will not conveniently execute the deeper part of the incision in a fat subject.

† See NOTE U.

‡ { Mr. Cooper has given a very partial view of lithotomy in the preceding chapter. He has neglected to notice the methods now in general use in France, Germany, and Italy, notwithstanding the weight of testimony, as well as of argument, is in favour of them. The Sansonian, or rectovesical operation of the Italian surgeons, is said to be altogether more simple and successful than either of the other modes of performing the low operation; and some of the first surgeons in France and Germany, have declared their opinions strongly in favour of the operation above the pubes. Indeed, Monsieur Amuzat has now established the high operation in Paris, almost to the exclusion of all the other methods. Dupuytren is reported to have spoken, at one of his public lectures, decisively in favour of it. His confidence is so strong in the experience of Amuzat, that he now considers every other method of cutting into the bladder as out of the question. Civiale's operation of lithontriptie is confined to a certain description of cases, in which a large and straight cannula can be readily conveyed into the bladder, and the calculus laid hold of by the forceps without any danger of involving a portion of the coats of that viscus. It is obvious, that the proportion of cases to which this operation is applica-

## CHAPTER LIX.

## SPINA BIFIDA, OR HYDRORACHITIS,

Is a swelling situated on the spines of infants, commonly on the lumbar vertebræ, occasionally on the dorsal, or cervical ones, and sometimes, though less frequently, on the os sacrum: it is filled with a limpid fluid, and arises from an imperfection

ble, must be very small in comparison with the whole number of patients actually afflicted with stone. It is equally obvious, that an unsuccessful attempt must be very liable to unhappy consequences, especially if any portion of the bladder happens to fall within the grasp of the forceps. A gentleman once expired on the evening after such an attempt had been made in this city by an eminent practitioner; in consequence of which, the operation fell into undeserved neglect among our surgeons.

The mode of performing the high operation has undergone a number of variations. Franco first performed it, in a case where the stone proved too large to admit of extraction through a double incision in the prostate. Notwithstanding he then penetrated the bladder in the two opposite points, above and below the pubes, the patient recovered without any unfavourable symptom. Douglass conceived that he had made an improvement upon this operation, by tying the penis several hours beforehand, and forcing the bladder to rise upwards into the abdomen. The peritoneum being then drawn up from above the pubes, along with the fundus of the bladder, would leave the anterior surface of the body of the viscus uncovered. A knife being plunged through the lower part of the *linea alba* would then reach the cavity of the bladder, without laying open the cavity of the abdomen.

Mr. Cheselden improved still further upon this method, by injecting mild diluents into the bladder, just before the operation, so as to distend it in the same way that Douglass had done, by obstructing the flow of urine. But both of these methods endangered consequent inflammation, by rendering the bladder irritable, and even sometimes paralytic.

Baseilhac (or *Frere Cosme*, as he has been called) afterwards improved the high operation in various ways; but chiefly by premising a small incision into the membranous portion of the urethra, through which the urine was drawn off, and an instrument introduced for the purpose of elevating the bladder above the pubes. His relatives, Pascal Baseilhac, and Soubertielle, continued this operation long after his death, with still further improvements, and with almost incredible success. It is reported, that they lost only one out of seventy or eighty patients, whereas Douglass and Cheselden had been in the habit of losing about one out of every twelve of all those on whom they performed their high operations.

Dr. G. M'Clellan has been, for several years past, an avowed advocate of the high operation; and although the first case in which he operated terminated unsuccessfully, in consequence of organic disease, he has continued to recommend it in the most decided terms in his public lectures. The mode which he adopts is to empty the bladder, first by a silver cathe-

of the bones, and a protrusion of the membranous lining of the spinal canal.

A tumour of a similar nature is sometimes seen on the head.\*

In spina bifida, the swelling is soft, and gradually diminishes, or even quite disappears on pressure; but the tumour returns immediately the pressure is removed. A fluctuation is distinctly perceptible in it. The integuments retain their natural appearance. Sometimes, children experience pain, when the tumour is compressed, or they are placed on their backs. The size of the swelling is various. One, situated on the sacrum of a healthy looking child, and larger than its head, was shown to me by my friend Mr. Maul, an eminent surgeon at Southampton; in general, the tumour seldom exceeds an orange in size.

The generality of children, affected with spina bifida, are deficient in strength, and subject to frequent diarrhœa. Incontinence of urine and the feces, emaciation, weakness, and even complete paralysis, are sometimes the concomitants of this serious complaint. However, some of the patients are, in every respect, except the tumour, perfectly healthy, and well formed.

The swelling consists of a sac, filled with an aqueous fluid, and composed of the integuments, and of the membranous sheath, which lines the canal for the spinal marrow. The lining of the spinal canal protrudes through a fissure in the ver-

ter, through which he repeatedly injects a small syringe full of warm water, so as to wash out the urine completely before making the incision. He then cuts down upon the empty bladder, through the lower part of the linea alba, exactly as the incision is conducted for securing the iliac arteries behind the peritoneum. The peritoneum being pushed up from behind the pubis, by means of the forefinger introduced through the incision in the linea alba, the bladder is of course drawn up along with it, and exposed to the point of the knife. A small incision is then made into the bladder, just behind the symphysis pubis, through which the stone is easily extracted, by means of a scoop, or a pair of forceps. A gum catheter is left in the urethra for a few days after, until the incision becomes so much indurated by adhesive inflammation, as to prevent all danger of infiltration of urine into the exposed cellular tissue. In this way he lately extracted a large calculus from a very corpulent old gentleman, sixty-four years old, whose prostate gland was so much enlarged, and whose perinæum was so exceedingly deep, as to preclude the possibility of performing either of the low operations. No symptoms of fever, or even of irritation, followed that operation; and the patient is now doing admirably well. He also extracted an oblong stone, nearly two inches long, from a little boy six years old, without any unfavourable consequence; although the bladder had been over-distended for some months, and the calculus was lodged in a *cul-de-sac*, just behind the umbilicus.

The Sansonian operation has not yet been performed in this country, although its merits were strongly urged upon the attention of practitioners, by the late Professor Brown, on his return from Europe.†

\* See Richter's Chirurg. Bibliothek. 9 band, p. 186.

tebræ, which is owing to an imperfect formation of these bones, and is commonly found at their posterior part, where the spinous processes would otherwise be. The preternatural opening is sometimes confined to one bone, the base of the swelling being then small. In many instances, the ossification of the posterior portions of several vertebræ is incomplete, so that the canal for the spinal marrow resembles an open furrow. Even the whole spine, from one end to the other, may be thus imperfect.\* The aperture has been known to extend through the body of the affected vertebræ, so that the finger could be passed quite into the abdomen.† In one example, there was not only a furrow in the vertebræ, but all the processes of these bones were wanting.‡

In general, the sac is filled with a clear, transparent fluid; but, occasionally, with a turbid, yellowish, or bloody secretion. The portion of the spinal marrow, surrounded by the fluid, is generally softened, and almost like mucus, or thin matter.§

Children afflicted with this disease, sometimes suffer, at the same time, from hydrocephalus. They seldom live longer than a year after birth. The tumour generally continues to enlarge. Occasionally, it inflames and ulcerates, and then death very soon follows. Children are observed to live longest, when the swelling is remote from the head. Few persons, labouring under this disorder, have attained the adult age, and their lower extremities have generally been in a paralytic useless state. A few examples are recorded, however, in which the patients lived to the ages of eight, seventeen,|| twenty,¶ and fifty.\*\* I was once shown by Mr. C. Hutchison, an enormous spina bifida in a young woman, at least twenty years of age.

Experience has fully proved, that puncturing the tumour with a lancet, and thus discharging the fluid, either at once, or gradually, cannot be done without putting the patient in the greatest danger, the consequences being for the most part fatal in a very short space of time. Also, when the swelling ulcerates, and bursts of itself, the child perishes; nor has tying the pedicles of such spinæ bifidæ as have narrow bases, proved more successful. Some years ago, Mr. Abernethy suggested the method of letting out the fluid, of closing and healing the

\* Maret, Mémoires de Dijon, vol. ii. p. 105.

† Saltzmann, De Tumoribus quibusdam Serosis Externis.

‡ Richter's Chirurg. Bibl. 4 b. 2 st. p. 350.

§ Mémoires de l'Acad. de Dijon, vol. ii. and Richter's Anfangsgr. der Wundarzneykunst, band 2, p. 236; Dritte Auflage.

|| Acrell, K. Vetenskaps Ac. Hædligar, 1748, p. 91.

¶ Warner's Cases in Surgery, p. 136, edit. 4.

\*\* Hochstaetter, Diss. de Spina Bifida, Altorf, 1703.



puncture immediately afterwards, and repeating the same proceedings, as often as necessary.\* He tried the plan in one instance, and though it was not attended with ultimate success, it did not bring on the suddenly fatal symptoms, which are the usual effects of letting out the fluid in the common way.

This last proposal, which originated with Mr. Abernethy, is highly important, inasmuch as subsequent operations have proved, that a practice, founded on the foregoing principles, may actually effect a cure of certain forms of a disease, that, until very lately, always baffled the art of surgery. It is to Sir Astley Cooper that we are indebted for some new attempts to cure the present disease; he tried the effect of puncturing the *spina bifida* with a fine pointed needle, instead of a lancet, letting out the fluid from time to time, and promoting a closure of the opening in the spine, with a compress and bandage. When this practice answers, the adhesive inflammation obliterates the cavity, in which the fluid was collected, and the disease ultimately does not return. In one case, Sir Astley Cooper thus accomplished a perfect cure.† He adopts, however, a palliative, or a radical treatment, according to circumstances.

The first consists in treating the case as a hernia, and applying a truss to prevent its descent: the second in pricking the tumour with a fine needle, and producing adhesion of the sides of the sac, so as to close the opening in the spine, and stop the disease altogether. The first is attended with no risk; the second exposes the patient to much constitutional irritation; but, if successful, hinders the future recurrence of the disease. Even when the adhesive process cannot be effectually accomplished by the first plan, the second, or palliative method, may yet be tried.‡

There are numerous cases of *spina bifida*, however, which leave no hope of cure. The following examples of this description are pointed out by Sir Astley Cooper.

If the tumour be connected with an unnatural enlargement of the head, *hydrocephalus internus* is conjoined with *spina bifida*; and whether the radical, or palliative treatment of the tumour on the back be tried, the water will accumulate in the ventricles.

If the lower extremities be paralytic, or the feces and urine be discharged involuntarily, there is no hope of relief.

If the tumour should burst at the time of birth, or soon afterwards, little expectation of a cure could be indulged; for,

\* See Abernethy's *Surgical and Physiological Essays*, parts 1 and 3.

† See *Med. Chir. Trans.* vol. ii. Case 2, p. 326.

‡ See Case 4, *lib. cit.*

although the opening in the skin might be closed with lint and adhesive plaster, and an union be produced, hydrocephalus internus would follow.

The deficiency of the spine is sometimes so great, that the tumour, at the time of the child's birth, is very considerable; the nerves protrude out of the spinal canal; and the spinal marrow is injured.

In this disease, purgatives and diuretics have been tried in vain; and no outward applications, excepting pressure, have been found to do the least good. Richter has suggested making two issues near the tumour;\* but I do not know that the proposal brings with it much promise of utility. In short, in the present state of our knowledge, the practice, tried by Sir Astley Cooper, is the only one, in favour of which, facts and actual experience can be adduced; and if we except his cases, no instance of a spina bifida being cured is upon record.

When the disease does not admit of the radical, or palliative cure, the surgeon should instruct the friends of the patient to keep the tumour out of the way of every thing that has a tendency to make it inflame and ulcerate; and, if any thing at all be done, the swelling should be tenderly bathed, every now and then, with spirituous and mildly astringent lotions, with the view of averting inflammation and ulceration of the skin.

## CHAPTER LX.

### AMPUTATION.

AMPUTATION is performed either in the continuity of a member, or at one of its articulations, each of which modes, however, cannot always be practised indifferently, the choice depending upon the situation, extent, and nature of the disease, or injury, for which the removal of the part becomes indispensable. In all amputations done at the joints, it is the general practice to make a flap of flesh for covering the end of the bone; but when the operation is performed at another part of the limb, it is frequently at the option of the surgeon, whether the method adopted be *amputation with a flap*, or *amputation by a circular incision*. In all common instances, the latter practice receives the approbation of many of the best modern sur-

\* Anfangsgr. der Wundarzneykunst, band 2, p. 240.

geons; but there are particular cases, in which a deviation from this mode, in favour of the flap operation, is commendable and useful, as I shall hereafter notice.

Before proceeding to the description of the methods of taking off limbs, let me just remind the reader of two lines, which convey a piece of general information of high value in this part of surgery, and constitute, as it were, one of the best fundamental rules for our guidance in the performance of amputation: "as little of the flesh should be cut away, as possible; but the more bone is removed, the better."\*

#### AMPUTATION OF THE THIGH.

The thigh should be amputated as low as the disease will allow. The patient is to be placed on a firm table, with his back properly supported by pillows, and assistants, who are also to hold his hands, and keep him from moving too much during the operation. The ankle of the sound limb is to be fastened, by means of a garter, to the nearest leg of the table.

#### TOURNIQUET.

The first thing is the application of the tourniquet. The pad of this instrument should be placed exactly over the femoral artery, in as high a situation as can conveniently be done. When the thigh is to be amputated very far up, a tourniquet is inconvenient, and, in this case, an assistant is to compress the femoral artery in the groin by any commodious instrument, having a round, blunt end, adapted for making direct pressure on the vessel, without injuring the integuments.

The latter method should only be adopted when the operation is to be done so high up, that the tourniquet would absolutely be in the way of the incisions. It is generally acknowledged, that some disadvantage results from the application of the tourniquet to a thigh on which amputation is practised, because the instrument tends to obstruct the full retraction of the muscles after they are divided. Yet, in ordinary cases, it is by no means advisable to prefer compression of the femoral artery in the groin by an assistant, to the employment of a tourniquet. Putting out of present consideration, his being liable to fail in regularly commanding the flow of blood through the artery, on account of the violent struggling of the patient, we are to remember, that besides this vessel, there are others concerned in supplying the thigh with blood, which are branches of the internal iliac, and come out of the lower openings of the pelvis;

\* "On doit couper des chairs le moins qu'il est possible, et des os, le plus qu'on peut." J. L. Petit, *Traité des Maladies Chirurgicales*, tom. iii. p. 150.

as, for instance, the arteria obturatoria, the iliaca posterior, or glutea, and the ischiadica. Hence, pressure upon the femoral artery in the groin can never stop the bleeding, but incompletely; and I leave it to every man of experience to contemplate, how many cases there are, in which not a drop of blood should be unnecessarily spilt. I would even urge, that, in numerous instances, in which the patient is much reduced at the time of submitting to the operation, any considerable hemorrhage must be regarded as a fatal occurrence.

#### FIRST INCISION.

The operator is to stand on the right side of the patient, whether the right or left limb is to be removed. By this means, he acquires the advantage of always having his left hand next the wound, so as to be of very essential assistance. This advantage more than counterbalances the inconvenience of having the right limb in the way of the operator, when the left thigh is that which is to be amputated.

An assistant firmly grasping the thigh with both hands, is to draw upward the skin and muscles with some force, while the surgeon makes a circular incision, as quickly as possible, through the integuments, down to the muscles. When the integuments are sound in the place of the incision and above it, their retraction by the assistant as soon as they are cut through, and a very slight division of the bands of cellular substance with the edge of the amputating knife towards the point, will generally preserve a sufficient quantity for covering, in conjunction with the muscles cut in a mode about to be described, the extremity of the bone; and the painful method of dissecting up the skin from the fascia, and turning it back, previously to dividing the muscles, may be considered useless and improper in all amputations of the thigh, where the skin retains its natural movableness and elasticity.

This practice of dissecting up and turning back about a couple of inches of the skin in cutting off a thigh, has been censured by some of the first practical surgeons which this country ever produced. Thus it was disapproved of long ago by Bromfield; and even Alanson, who praised the method in the earliest edition of his book, thought proper afterwards, when further experience had brought his judgment to greater maturity, to deliver a very different sentiment upon the subject. From the example set me by some of the former surgeons of St. Bartholomew's hospital, during my apprenticeship there, I also once fancied, that, in amputation of the thigh, a considerable dissection of the skin from the muscles previously to the division of the latter, was a matter of absolute necessity. The experience, however, which



I had in the course of the last two wars, soon produced in my mind a different conviction.

For some useful remarks on this point, the profession are indebted to Mr. Guthrie, who has explained, that, in primary amputations, or those done at an early period after the receipt of a gun-shot injury, while the part of the limb, where the incisions are to be made, is in the natural state, and the skin loose and movable, "it will be sufficient to touch the thread of membrane, or fascia adhering below, with the point of the same, (the amputating) knife, to give ample covering for an excellent stump, without putting the patient to the torture of having his skin pinched and dissected back, for the space of a couple of inches, for four or five minutes." At the same time, he particularly insists on the utility of dividing the fascia and integuments together, by which means the latter can be retracted much further than would otherwise happen.

In operations, however, performed from the third to the twelfth day after the receipt of the wound, and near the injured parts, Mr. Guthrie admits the propriety of dissecting the integuments a little way up from the fascia, as in these cases the retraction, effected by the assistant and the natural elasticity of the skin, will not avail in saving enough of it to cover the surface of the stump well; yet even here he rightly disapproves of turning back the separated integuments, as is often done, like the top of a glove.

In secondary amputations, (says he,) with the exception of those, in which the operation is required in parts actually unsound, the integuments may be sufficiently retracted, without any formal dissection of them from the subjacent fascia.\*

Besides the objection to such dissection, on the ground of the great agony which it excites, it should never be done unnecessarily, on another account, particularly insisted upon by Loder, viz. because a redundancy of skin is apt to serve as a lodging place for matter, and be the means of preventing the thing which is always particularly desirable, namely, union by the first intention.†

It is difficult to give any exact general rules for determining

\* G. J. Guthrie on Gun-shot Wounds of the Extremities, requiring the different operations of Amputation, with their after-treatment, &c. pp. 84, 85. 8vo. Lond. 1815.

† Chirurgische-Medicinische Beobachtungen, p. 6. The above objections to the common mode of dissecting up the skin freely, and turning it back, must be limited to amputations of the thigh and upper arm, for, in removing the lower extremity below the knee, the preservation of skin enough to cover well the tibia, and outer parts of the stump, require something more than drawing the integuments upwards at the period of their division.

how much skin is to be saved. According to Loder, the less bulky the limb is, the less need the edge of the integuments project beyond the surface of the divided muscles; and the more fat there is, the greater must be the length of the preserved skin. In the first case, (says he,) about half an inch will be enough; in the second, an inch or more, will be requisite. The more obliquely the incision is made through the muscles, the less necessary will skin be for covering them afterwards, because their edge will be thin. But, in the opposite case, a larger piece of skin will be wanted for covering the bulky ends of the muscles. When the parts are sound above the place of the incision, the greater or lesser breadth of the projecting edge of the skin will always depend upon the retraction of it at the period of its division. If the assistant draw it back with force, more will be saved; and if it be drawn back but a little way, the part projecting beyond the edge of the muscles will be but small. The assistant, in drawing back the integuments, is to be particularly careful to do this evenly and smoothly all round the member, so that the skin may not be wrinkled, nor pulled up more in one place than another.\*

I have said, that the surgeon is to begin the operation by making an incision through the skin all round the limb. The generality of surgeons, very rightly considering this as one of the most painful parts of the operation, do it with as much quickness as possible, and therefore carry the knife all round the member with one sweep, the hand which holds the knife being carried round under the limb until the edge can be placed perpendicularly on the skin covering the extensor muscles. Excepting the appearance of greater skill, and a little greater quickness, however, the forgoing mode of dividing the skin all round the limb with one stroke of the knife, has no particular advantage over the method of completing the cut with two sweeps of the knife.

#### OF DIVIDING THE MUSCLES.

The ancient surgeons used to cut directly down to the bone at once, and the frequent consequence was a conical, or sugar-loaf stump, extremely unfit for bearing any degree of pressure, and, therefore kept healed with difficulty. The end of the bone in fact, often protruded beyond the soft parts. At length, however, the improvement was made of cutting the integuments through first, and then the muscles: a method well known amongst surgeons by the name of the *double incision*.

But, although the double incision enables the surgeon to save

\* Loder, lib. cit. p. 7.

skin, and saw the bone higher up, a conical stump, and projection of the bone, sometimes followed. The great innovations, which ultimately proved nearly effectual in the prevention of such tedious miserable cases, were, besides the saving of skin, the oblique division of the muscles, suggested by Alanson; the cutting of the loose muscles first, and the fixed ones afterwards, proposed by Louis; and the immediate closure of the wound, after the bleeding had been stopped, the great utility of which was first brought to light in the early trials of what are called flap-amputations.

M. Louis, for whose memory every admirer of surgical science ought to entertain sincere respect, first discerned the principal cause of the projection of the bone. He observed, that the muscles of the thigh became retracted in an unequal manner, when divided; those which are superficial, and extend along the limb more or less obliquely, without being attached to the bone, becoming retracted with greater force, than others, which are deep, and, in some measure, parallel to the axis of the femur, and fixed to this bone throughout its whole length. Their retraction begins at the moment of the operation, and, for some time afterwards, continues unfinished. Hence, the effect should be promoted, and be as complete as possible, before the bone is sawn. With this view, M. Louis practised another kind of double incision; by the first, he cut, at the same time, both the integuments, and the loose superficial muscles; by the second, he divided those muscles, which are deep, and closely connected with the femur. On the first deep circular cut being completed, M. Louis used to remove the band encircling the limb above the tract of the knife, in order to allow the divided muscles to become retracted without any impediment, and he then cut the deep, muscles on a level with the surface of those which had been first divided, and which were now in a retracted state. In this way, he could evidently saw the bone very high up, and the painful dissection of the skin from the muscles was avoided.\*

Alanson's mode of amputation was as follows:—The integuments having been divided by a circular wound, the knife was applied close to the margin of the retracted skin, upon the inner edge of the vastus internus, and at one stroke, an incision was made obliquely through the muscles, upward in respect to

\* See *Mémoire sur la saillie de l'os après l'Amputation des Membres; ou l'on examine les causes de cet inconvénient, les moyens d'y remédier, et ceux de la prévenir.* Also, *Second Mémoire sur l'Amputation des Membres, Mém. de l'Acad. de Chirurgie*, tom v. pp. 224 and 401. edit. in 12mo. And *Nouvelles Observations sur la Rétraction des Muscles après l'Amputation de la Cuisse, et sur les moyens de la prévenir.* Op. cit. tom. xi. p. 63, edit. in 12mo.

the limb, and down to the bone: in other words, the cut was made in a direction which laid the bone bare, about two or three finger-breadths higher than a perpendicular incision would have done. The operator now drew the knife towards himself, so that its point rested upon the bone, still observing to keep the instrument in the same oblique position, in order that the muscles might be divided all round the limb in that direction, by a proper turn of the knife. During the performance of this movement, the point of the knife was kept in contact with the bone, round which it revolved.\*

Many writers have objected to the difficulty of making the oblique incision exactly as Alanson has directed, and Mr. Hey even questions the possibility of the practice, without a different result from what Mr. Alanson intended. It is evident (says Mr. Hey,) that a conical incision through the muscles of the thigh cannot be made with a continued stroke, in the usual mode of amputating. For, supposing the edge of the knife to have once penetrated obliquely through the muscles, so as to be an inch higher, when arrived at the bone, than when it penetrated the surface; if the incision be continued with a flowing stroke, the knife must then cut the surface of the undivided muscles an inch higher, than at the commencement of the incision.† How far it is actually practicable to keep the point of the knife in contact with an exact circle on the bone, during the oblique passage of the instrument all round the member, it is not for me to say, because, seeing its difficulty, I have never attempted it; nor can I suppose, that Alanson himself ever really did what he literally recommends. Of one thing also I am sure, that I have seen many surgeons, in their attempt to do this business after Alanson's directions, get so high up as to cut the subjacent reflected skin.

The late Mr. Hey is not the only, nor the earliest writer, who has pointed out the inaccuracy of Alanson's directions. Richter has offered several judicious criticisms upon them, which perfectly coincide with Mr. Hey's views. It is remarked, that when the knife, with its edge turned obliquely upwards, has reached the bone, a flap is actually formed on the side where the incision is practised: and the edge of the knife is now three inches higher than the cut in the skin. In this state, the surgeon cannot possibly continue the incision. The only thing which he can now do, is to place the knife on the opposite side of the thigh in the same manner, and make a flap there. The operation, says Richter, is then rather a flap-amputation, not done in the best way, than an operation really

\* See Alanson's *Practical Obs. on Amputation*, 2d ed.

† Hey's *Practical Observations in Surgery*, p. 529, edit. 2.



practised as Alanson thought possible. By following precisely his instructions, Richter thinks it would be quite impracticable to form a hollow stump, though perhaps it might be done by reiterated oblique strokes of the knife all round the limb. But, he exclaims, what a stump there would then be, and what a method of operating! He comments also on the difficulty of making a knife cut properly by mere pressure, as would be the case, were its point kept unremittingly against the bone, in carrying the incision round the member; on the preferable nature of amputation with a flap to this method, the wound left by which is longer in healing; and on the pain and delay of separating the skin to be saved, a proceeding altogether unnecessary in amputating with a flap.\* These observations are partly correct; but they are to be regarded as coming from a surgeon, who was extremely partial to the flap-operation, and did not attach the proper value to the suggestion of making in a right manner the oblique division of the muscles.

Many excellent surgeons, whom I have seen operate, do not cut at once obliquely down to the bone, after the integuments have been divided and retracted; but so far adopt the principles of M. Louis, as to divide the loose muscles first, and lastly, those which are intimately attached to the bone, taking care, with a scalpel, to cut completely through the deep muscular attachments, about an inch higher up, than could be executed with the amputating knife itself. This last measure causes very little pain, and has immense effect in averting all possibility of a subsequent protrusion of the bone, or of a bad sugar-loaf stump. Such used to be the practice of Mr. Hey, who calls it the *triple incision*:† and Mr. Guthrie,‡ in his account of amputation of the thigh, is a decided advocate for a similar mode. In this method, however, the advantage of the oblique incision through the different layers of muscles, was invariably retained. While I served in the army, I always endeavoured, in the performance of amputations, to combine, as far as circumstances would allow, the principles of Alanson with those of M. Louis. This is certainly a better mode of operating, than that in which Mr. Alanson's directions are precisely followed. However, I am obliged to state, that the attempt to divide the loose muscles first, and then the more fixed ones, is apt to make a hasty surgeon cut the whole, or a great part of the same muscle through more than once; a fault in modern practice, which, as far as my judgment extends, deserves reprobation, as much as any proceeding which can be instanced. To

\* Anfangsgr. der Wundarzn. b. vii. p. 187.

† Hey's Practical Observations in Surgery, p. 526, edit. 2.

‡ On Gun-shot Wounds of the Extremities, &c. p. 86.

say how unnecessary it is to divide any muscle, more than once, is as needless as to remind the reader of its doubling the agony of a most severe operation.

In the descriptions of amputation, usually met with in books, some pains are taken to expose the advantages of holding the limb in a half-bent position while the division of the muscles is going on, in order that the flexor and extensor muscles may be in an equal relaxation. This advice may be good, if it can be followed: and the plan of relaxing each set of muscles as much as possible by a change in the posture of the member when they are about to be cut, as has been sometimes recommended, might be still more rational, as being conducive to the preservation of a greater proportion of flesh. But, unfortunately, the operator, who begins to think of these projects when his patient is upon the table, generally finds them impracticable, the disease, or injury, having already so fixed the posture of the member, that little or no deviation from it can be made, without the greatest difficulty and pain.

#### USE OF THE RETRACTOR.

Having cut completely down to the bone, a piece of linen, somewhat broader than the stump, should be torn at one end, along its middle part, to the extent of about eight or ten inches. This is called a retractor, and is applied by placing the exposed part of the bone in the slit, and drawing the ends of the linen upward on each side of the stump. Thus the retractor will evidently keep every part of the surface of the wound out of the way of the saw. I have seen the saw do so much mischief, in consequence of neglecting to use the retractor, that my conscience obliges me to censure the employment of the saw, without a defence of the soft parts by this simple contrivance. I think no one will say, that the retractor can do harm; and I know, that many who have been with myself eye-witnesses of the mischief frequently done by the saw in amputations, are deeply impressed with an aversion to the neglect of this bandage. I have often seen the soft parts skilfully divided; and the operators, directly afterwards, lose all the praise, which every one was ready to bestow, by their literally sawing through one half of the ends of the muscles, together with the bone. But, besides defending the surface of the stump from the teeth of the saw, the retractor will undoubtedly enable the operator to saw the bone higher up, than he otherwise could do.\*

\* *Petit* earnestly recommends the employment of a linen retractor: when a surgeon once told him, that he did not use it, because the teeth of the saw were apt to get entangled in it, he answered: "Il est vrai que cela peut arriver lorsqu'on ne sait pas le placer; les meilleures manières d'opé-

## OF SCRAPING THE BONE.

Another proceeding, deserving reprobation, is the practice of scraping up the periosteum with the knife, as far as the muscles will allow. This is a sentiment, in which I must still continue to join the experienced and judicious Petit, notwithstanding a modern author\* has actually devoted a section of his book to the praise of what is here particularly condemned. The chief argument for the practice, urged by Brunninghausen, is, that by scraping the periosteum upwards from the bone, a portion of the detached membrane will yet remain connected to the muscular fibres, thus pushed back, and afterwards admit of being brought down with them over the sawn bone. As, however, I have seen the bone extensively scraped, without an exfoliation being a regular effect of the method, I do not consider, as Petit did, that a part of the bone must *inevitably* die, after the periosteum is thus freely scraped away; but I look upon the improper and useless separation of this membrane, as one of the circumstances which tend to produce the exfoliations, that sometimes happen after amputations. At all events, it is a superfluous, useless measure; as a sharp saw, such as ought to be employed, will never be impeded by so slender a membrane as the periosteum.† All that the operator ought to do, is to take care to cut completely down to the bone, round the whole of its circumference. Thus a circular division of the periosteum will be made, and here the saw should be placed.

In confirmation of the correctness of the foregoing advice, I beg leave to quote what Richter has said upon the subject of scraping the periosteum off the bone. The thin layers of flesh, (says he,) which, when the soft parts are drawn up, usually remain here and there upon the part of the bone about to be sawn, the surgeon should now cut carefully through with a scalpel, together with the periosteum, as high as possible, and close to the slit in the retractor. It is quite unnecessary, he observes, to scrape away the periosteum from the place where the saw is to be applied. Neither this membrane, nor a few slender muscular fibres, can hinder the action of the saw, and, after the last sweep of the scalpel, they are lifeless and insensible.‡

rer ont leur inconvénient, si on néglige les circonstances qui les font réussir." *Traité des Maladies Chir.* t. iii. p. 152.

\* H. J. Brunninghausen, *Erfahrungen und Bemerkungen über die Amputation*, p. 67. Bamberg, 1818.

† Petit's opinion is thus expressed: "Si par trop d'exactitude, on dépouille trop en avant les os de leur périoste, l'exfoliation, qui devient inévitable dans ce cas, se fait long-temps attendre, et retarde beaucoup la guérison: je préfère donc de scier le périoste, avec les os; j'ai toujours éprouvé que cette méthode étoit moins douloureuse et qu'elle évitoit souvent l'exfoliation." Vol. cit. p. 158.

‡ *Anfangsgr. der Wundarzn.* b. vii. p. 179

## OF THE MANNER OF SAWING THE BONE.

As Petit justly remarks, this part of the operation is by no means easy to a person unaccustomed to handle a saw. The principal difficulty arises from the bone being sawn up in the air (as it were); at least, the part is in general but very imperfectly fixed by two persons, who, however strong they may be, cannot resist the saw, and hinder the limb from being shaken, whereby the direction of the instrument becomes altered. Besides, the two assistants rarely act so well in concert together, as always to hold the limb in the same direction, and with an equal degree of strength. It is true, such irregularity is not of much consequence at first, while the bone is not half sawn through; but, as soon as the instrument has cut to this depth, the irregular movements of the assistants, who hold the limb, make the sawn surfaces come nearer together, and the saw is so pinched or locked betwixt them, that it cannot stir, in one direction, or the other.

A skilful surgeon, (observes Petit,) may obviate the difficulty by supporting the part with his left hand, and resisting or yielding at seasonable opportunities to such circumstances as impede the motion of the instrument. But, the difficulty may depend upon the saw itself, when its blade is not duly stretched, the teeth not well turned alternately to the right and left, their points not in good order, their edges not sharp enough, or they are not filed obliquely, so that the bone-dust may be readily thrown off to each side. The latter object requires also, that the blade of the saw at the teeth-part should be rather thicker than the rest of it, or else the fissure in the bone would be completely filled with the instrument, and the bony particles, not easily escaping, would obstruct the movements of the saw. In order to saw the bone as close to the flesh as possible, Petit says the nail of the index-finger of the left hand is to be placed on the point where the sawing is to begin. Many surgeons, however, find it more convenient to use the left thumb-nail for this purpose. The flesh being retracted, the saw is now to be applied exactly at the angle formed by the nail and the bone; and the instrument is to be worked very gently, and with scarcely any more pressure than that of its own weight, until a groove is cut, from which it will not start, when the force is to be gradually increased.\*

The edge of the saw should cut with both edges, whether the instrument be moved backwards or forwards, by which means, as a modern writer† has remarked, the operation will be expedited, and the splintering of the bone, when it is nearly divi-

\* Petit, *Traité des Maladies*, Chir. t. iii. pp. 159, 160.

† G. J. Guthrie on *Gun-shot Wounds of the Extremities*, &c. p. 89.



ded, prevented, inasmuch as the surgeon, when he uses a saw, which cuts in both directions, has it in his power to finish the latter part of the division of the bone entirely with backward sweeps of the instrument, which are always the most regular and gentle.

In order to form a groove for the saw, it is best to begin by drawing the instrument across the bone with a backward sweep, the teeth near the handle being first applied to the part close to the operator's left thumb, or finger-nail, and the whole extent of the edge is then to be steadily and briskly drawn back to the point. The movements of the saw should never be short and rapid, but every stroke of the instrument should be long, bold, and regular, without too much pressure, which is one common cause of the awkwardness so often displayed in this part of the operation. When about two-thirds of the bone are cut through, the pressure and force must be lessened, and towards the end of the business, two or three gentle movements of the saw backward will complete it, without risk of an extensive splintering. In the latter part of the sawing, the assistant who holds the leg, must be very careful to avoid depressing the condyles of the femur, as it would inevitably break the bone, previously to its complete division. Indeed, it is difficult to say, whether this mismanagement, or the rough unskilful mode of using the saw itself, is the most frequent cause of the latter accident. The assistant certainly has rather a delicate task to perform, because if he raises the limb too much, he pinches the saw; if he depresses it, he breaks and splinters the bone.

If the bone should break, before the sawing is finished, the sharp projecting spiculæ, thus occasioned, must be removed by means of a pair of bone-nippers.

#### OF STOPPING THE HEMORRHAGE.

After the removal of the limb, the femoral artery is to be taken hold of with a pair of forceps, and tied, without including the accompanying branches of the anterior crural nerve in the ligature.\* None of the surrounding flesh ought to be tied, though the ligature should be placed round the artery, just where it emerges from its lateral connexions. Desault recommends tying the femoral vein, as well as the artery; because when the former remains open, and the bandage compresses the upper part of the limb too forcibly, the venous blood returns downward, and hemorrhage takes place.† Mr. Hey also met with a few instances of bleeding from the femoral vein, and therefore,

\* See NOTE V.

† Œuvres Chir. de Desault par Bichat, tom. ii. p. 550. Venous hemorrhage almost always ceases on the removal of the tourniquet, or any other tight bandage.

he generally enclosed it in the ligature along with the artery.\* When the two vessels lie near each other, as is frequently the case, Desault advises the surgeon to introduce one branch of the forceps into the artery, and the other into the vein: their mouths are then to be drawn out, and tied with one ligature. When, however, they are not so close together, they require two separate ligatures. The smaller arteries are usually taken up with a tenaculum. After tying as many vessels as require it, one-half of each ligature is to be cut off near the surface of the stump. The right qualities of ligatures, used for securing blood-vessels, having been considered in the chapters on hemorrhage and aneurism, it is unnecessary now to return to that interesting topic; nor shall I here speak again of the proposal of removing both ends of the ligature close to the knot.

When the large bleeding vessels have been tied, the tourniquet should be slackened, and the wound well cleaned, in order to detect any vessel, which may lie concealed, with its orifice blocked up by coagulated blood; and, before the dressings are applied, the whole surface of the wound should be examined with the greatest accuracy. By this means, a pulsation may often be discerned, where no hemorrhage has previously appeared, and a small clot of blood may be removed from the mouth of a considerable artery.

As the lodgment of much coagulated blood would be unfavourable to the speedy union of the wound, the surgeon has an additional motive for being careful to make its whole surface clean with a sponge and water, before it is finally closed. The number of arteries, requiring to be tied, will depend very much upon the incision having been done upon sound and uninfamed parts, or upon parts in a state of inflammation, swelling, and disease. This accounts for the truth of an observation made by military surgeons, that, in amputations done immediately, or soon after the receipt of an injury, there are fewer vessels to be taken up, than in what are termed secondary, or long-delayed operations.†

I have occasionally seen examples, in which it has not been necessary to take up a single artery. A young child was run over by a hackney coach, the wheel of which crushed the lower part of the leg, and rendered immediate amputation necessary. The operation was done by the late Mr. Ramsden without delay; no vessel was tied; and the stump healed without any subsequent bleeding. This was one case which I saw, and attended myself. In St. Bartholomew's Hospital, some instances also fell under my notice, where arteries like the ulnar and an-

\* Hey's Practical Obs. in Surgery, p. 530, ed. 2.

† See Guthrie on Gun-shot Wounds, &c. p. 90.

terior tibial, even in adults, required no ligature. The absence of hemorrhage is sometimes explicable by the clot of blood, formed in the large vessels in cases of gangrene. Thus, a modern surgeon tells us, that he amputated the arms of two Cossacks, four months after the limbs had been shot through above the elbow, and while they were affected with hospital gangrene: not a vessel was tied; no secondary hemorrhage arose; and the stumps healed in the most favourable manner.\*†

OF DRESSING THE STUMP.

The skin and muscles are now to be placed over the bone, in such a direction, that the wound may appear only as a line, across the face of the stump, with the angles at each side, from which points, the ligatures are to be left out, as their vicinity to either angle directs. The skin is commonly supported in this position, by long strips of adhesive plaster, applied from below upwards, across the face of the stump. Over these, and the ends of the ligatures, it is best to place some pieces of lint, spread with the unguent. sperm. cet., in order to keep them from sticking, which becomes a troublesome circumstance, when the dressings are to be removed. I am decidedly averse to the plan of loading the stump with a large mass of plasters, pledgets, compresses, flannels, &c. I see no reason, why the strips of adhesive plaster, and a pledget of simple ointment, should not suffice, when supported by two cross-bandages and a common linen roller, applied in a spiral way round the limb, from above downward. The first turn of the roller, indeed, should go round the patient's body; and, being continued down, will fix the two cross-bandages over the end of the stump. Here, as after all other operations, the dressings should generally be superficial, and make no compression: if the vessels have been properly secured, there is no risk of hemorrhage; and if they have not, is it not a little degree of constriction that will hinder bleeding. Besides, much pressure has the serious inconvenience of irritating the parts, exciting inflammation and suppuration, causing absorption of the cellular membrane, and a sugar-loaf stump.‡

The elastic woolen cap, sometimes placed over all the band-

\* Klein, *Practische Ansichten der bedeutendsten Chirurgischen Operationen*, 1tes Heft. p. 62. 4to. Stuttgart, 1816.

† {The treatment recommended by Dr. Koch of Bavaria, has not as yet been adopted by any surgeon within our knowledge, although the Journals state, that both the doctor and his son have repeatedly succeeded in healing up stumps after amputation, without securing a single artery. He depends exclusively on well regulated pressure, and perfect coaptation of the flaps, as they are brought together from the opposite sides of the stump.}

‡ *Œuvres Chir. de Desault*, t. ii. p. 552.

ages and dressings, if not put on with a great deal of care, has a tendency to push the skin backward from the extremity of the stump, and, as it must also heat the part, its employment should be discontinued.

The stump should rest upon a pillow of moderate thickness, for, bending the thigh-bone too much, produces a retraction of the flexor muscles.

If possible, the dressings should never be removed before the third day; but, in general, it is quite soon enough to change them on the fourth or fifth: when the weather is hot, and there is much discharge, they should be taken off earlier than under other circumstances. The favourable healing of a stump will depend very much upon the skill and tenderness with which the dressings are changed, more especially the first dressings. In order to facilitate the removal of the plasters, they should be first thoroughly wet with warm water, which is not to be rubbed upon them with a sponge, but allowed to drop, or flow over them. Each strip of plaster should be taken off, by raising its ends and drawing them gently up together towards the extremity of the stump, by which means, the surgeon will avoid pulling the recently united parts away from each other. During the change of the dressings, an assistant is always to support the flesh, and keep it from being retracted, and for the more complete prevention of the same disadvantage, it is a good rule never to let every strip of plaster be off the limb at one time; but, as soon as some are removed, to put on others, before the rest are loosened and taken away. It is hardly necessary to add, that, when matter is collected within the stump, it should be very gently compressed out with the sponge, in doing which, the pressure should be so regulated, as not to force back the flesh.

At the end of five or six days, the surgeon may begin to try, in a very gentle manner, whether any of the ligatures are loose. However, he should not use the smallest force, nor persist, if the trial create pain. One would hardly try, whether the ligature on the great artery were loose, before the eighth or ninth day.

#### FLAP-AMPUTATION OF THE THIGH.

Although this operation is not generally regarded as the best method for ordinary cases, its advantages, under particular circumstances, begin to be acknowledged by many surgeons of judgment and experience. In Germany, as far as I can judge from the latest works published there on the subject of amputation, flap-amputations have numerous advocates; and, I believe, that whoever will take the trouble of inquiring into the actual state of surgery in that country, will find this method



of operating quite as frequently practised as the circular incision.\* Desault employed both modes on the thigh, or arm, indifferently; though he did not apply the flap-amputation to the leg, or fore-arm.† In England, where the latter method first originated with Lowdham, and where it has at various periods been strongly commended and improved by several men of great eminence, it has not many advocates for its general adoption, though Mr. Liston, Mr. Symes,‡ and some other respectable surgeons at Edinburg, urgently recommend it for ordinary practice. The chief objections to the operation, when proposed as the common method, arise from two considerations: first, its greater pain,§ than that of the usual mode: secondly, its shortening the limb more than is necessary. Yet, all British surgeons agree that flap-amputations are generally best, when a limb is to be taken off at a joint, and also, in every instance in which the skin and soft parts are quite sound on one side of a member, while, on the other, they are diseased, or destroyed for a considerable extent, upwards. Here, amputating with a flap will be the means of preserving more of the limb, than could be saved by the circular incision, and becomes praiseworthy on the very same principle, which renders the latter method most eligible under ordinary circumstances.

As Mr. Hey has remarked, sometimes the integuments of the thigh are in a morbid state on one side of the limb, while they are sound on the other. In this case, a longer portion of integuments and muscular flesh must be left on the sound side; which will not prevent the formation of a good stump. The morbid state of the anterior or posterior side of the thigh sometimes extends so far above the knee, that it is advisable to amputate with a flap.||

\* Consult particularly C. C. Siebold, *Diss. de Amputatione femoris cum relictis duobus carnis segmentis*, Wirceb. 1782; Gräfe, *Normen für die Ablösung grösserer Gliedmassen*, Berlin, 1812; Richter, *Anfangsgr. der Wundarzneykunst*, b. vii.; Kap. 7. 8vo. Göttingen, 1804; Klein, *Practische Ansichten der bedeutendsten Chirurgischen Operationen*, 1tes Heft. 4to. Stuttgart, 1816; H. J. Brunninghausen, *Erfahrungen und Bemerkungen über die Amputation*, 12mo. Bamberg, 1818. This last surgeon recommends making the flaps from the integuments, and not from the muscles, which, he asserts, shrink and diminish after the operation, so as not to form a durable cushion for the end of the bone.

† *Œuvres Chirurgicales de Desault*, t. ii. p. 547.

‡ See *Edinb. Med. and Surg. Jour.*

§ Klein, who has decided in future always to amputate the thigh with a flap, in consequence of this method forming a better stump, and the wound healing in less time, than after the circular incision, owns that the operation is attended with a great deal more pain. See *Practische Ansichten der bedeutendsten Chirurgischen Operationen*, 1tes Heft. pp. 34, 35.

|| Hey's *Practical Observations in Surgery*, p. 531, ed. 2.

At the upper part of the thigh, Mr. Guthrie\* prefers amputating with a flap as a general practice; but, unless there were some particular circumstances present, some motives like those already suggested, I should not be disposed to select, what is allowed to be by far the most tedious and painful method of amputating. Were the thigh-bone, however, injured high up, and had gangrene extended about the trochanter major and posterior upper part of the thigh, if the head of the femur were sound, and the patient able to bear the operation, I would then do as Klein did—make a flap at the inner and upper part of the member.† The execution of a flap-amputation of the thigh will be attended with some difference, according as the soft parts on all sides of the limb are sound, or not. When, in consequence of the flesh being injured or diseased on one side, the flap must be entirely formed on the other, it will be necessary to save more skin and muscle in the latter situation, than if the surgeon had it in his power to form two flaps for covering the end of the bone. In performing the latter operation on the thigh, Desault used to grasp the flesh on its inner side with his left hand, and pass a straight, narrow, sharp-pointed knife, with its edge turned towards the knee, through the soft parts thus taken hold of, pushing it on from the fore-part of the thigh, until the point come out at the back of the limb. The incision was then extended obliquely downwards, so as to make a flap about four inches in length, comprehending part of the cruralis, the vastus internus, the femoral artery and vein, the anterior crural nerve, the triceps, sartorius, gracilis, semi-membranous, and semi-tendinosus muscles. This first flap was then reflected, and the femoral artery and vein, and the trunk of the profunda, tied. The external flap was next formed in a similar way, and consisted of the rest of the cruralis, the rectus, the vastus externus, and biceps. The two flaps were then held back, the bone sawn through as high as possible, the other bleeding vessels secured, and lastly the flap brought down, so as to meet in a perpendicular line, and cover the end of the bone.‡§

\* On Gun-shot Wounds of the Extremities, p. 200.

† *Practische Ansichten der bedeutendsten Operat.* p. 39, 1tes. Heft. The soldier, thus treated, got well in three weeks. See also another case, p. 42, in which it was necessary to make a flap at the inside of the limb, in consequence of a sinus extending far up towards the buttock, and rendering a circular incision unadvisable. This operation succeeded, though done only one inch below the great trochanter.

‡ See *Œuvres Chir. Desault*, p. 539. As taking up the vessels before the bone is sawn, keeps the patient in an anxiety, which never ceases before the limb is off, I should prefer imitating Klein, and saw the bone, before searching for the artery, as in a common amputation. See Klein's *Practische Ansichten der bedeutendsten Chir. Operat.* 1tes Heft. p. 37.

§ {Dr. G. McClellan performs the flap-operation on the thigh nearly in

## AMPUTATION BELOW THE KNEE.

In the thigh, amputation is done as low as the case will allow. In the leg, the common practice is to make the incision through the integuments sufficiently low, to enable the operator to saw the bones, about four inches below the lower part of the patella. This is necessary, in order to have a sufficient surface in front of the limb for the application of a wooden leg, and not to deprive the stump of that power of motion, which arises from the flexor tendons of the leg continuing undivided.

The tourniquet should be applied to the femoral artery, two-thirds of the way down the thigh, just before the vessel perforates the tendon of the triceps muscle; this is a much more convenient situation than the ham. The leg being properly held, the integuments should next be drawn upward by an assistant, while the surgeon, with one quick stroke of the knife, divides the skin completely round the limb.

Some recommend the operator to stand on the inside of the leg, in order that he may be able to saw the bones at once. No reflections could ever make me perceive, that any real advantage ought strictly to be imputed to this plan. I know, many fancy that it diminishes the chance of the fibula being splintered, as this bone is completely divided rather sooner than the tibia. But, as splintering the bones arises from the assistant, who holds the leg, depressing the limb too much, it would be difficult to explain, why the two bones should not be splintered, when a certain thickness of them had been sawn through, if the leg were too forcibly depressed.

Having made a circular division of the integuments, the next object is, to preserve skin enough to cover the front of the tibia, and the part of the stump corresponding to the situation of the tibialis anticus, extensor longus pollicis, and other muscles, between the tibia and fibula, including those covering the

the same way as has been recommended by Lisfranc. He thrusts a catling first through the inside of the limb, and cuts it out obliquely downwards. He then turns the instrument in the opposite direction, and cuts the outer side in the same manner; and if the angles made between these incisions before and behind are not fully made, he lays them open with the point of the catling, and dissects all the muscular fibres that remain undivided up from the bone. He then elevates the limb to an angle of 45 degrees above the horizon, and saws the bone across. The arteries are then secured, and the flaps brought into contact by suitable dressings.

He once performed the operation at the trochanter minor in nearly the same way on one of Dr. Runkle's patients in Germantown. He secured the crural artery above the *profunda* in that case, before taking up the catling; and made that incision the anterior angle between the two flaps. Lisfranc's practice is to make the inner flap first, and then to secure the divided arteries; after which he proceeds to make the outer flap and to saw through the bone. }

latter bone. Throughout this extent, there are no bulky muscles which can be made very serviceable in covering the end of the stump, and consequently the operator must here have sufficient skin, by dissecting it up, and turning it backwards.

On the posterior part of the leg, the skin should never be detached from the large gastrocnemius muscle, which, when obliquely divided, will, with the soleus, here form a sufficient mass for covering the stump. Hence, as soon as the skin has been separated in front, and on the outside of the leg, the surgeon is to place the edge of the knife in the incision of the integuments, and cut in the Alansonian way through the muscles of the calf, from the inside of the tibia, quite to the fibula. Then the flap, formed by the calf of the leg, is to be held back by the assistant, while the surgeon completes the division of the rest of the muscles, together with the interosseous ligament, by means of the catling, or a long, very narrow, double-edged knife.

In amputating below the knee, particular care must be taken to cut every fasciculus of muscular fibres, before the saw is used. Every part being divided, except the bones, the soft parts are next to be protected from the saw, by a linen retractor, made with three tails, one of which is to be drawn through the space, between the tibia and fibula.

In the leg, only three principal arteries require ligatures; viz. the anterior and posterior tibial, and the peroneal, arteries.

When the wound is to be dressed, the soft parts, preserved for covering the bones, should be brought together, so as to make the line of their union not transverse, but obliquely perpendicular, the lower end of it being more external than the upper. Thus the tibia and fibula may be effectually covered, without the strips of adhesive plaster forcibly pressing the skin against the sharp edge of the tibia. The plaster, which makes most pressure, should go over the centre of the stump, at the point corresponding to the interosseous space.\*

#### AMPUTATION OF THE ARM.

The structure of the arm bears a great analogy to that of the thigh. There is only one bone, round which the muscles are arranged, the deep ones being adherent to the os brachii, while the outer ones extend along the limb, without being attached to this bone. The first are the brachialis internus, and the two short heads of the triceps; the others are, the long portion of the latter muscle, and the biceps. Hence amputation, in this

\* There are cases, in which it may be advisable to amputate below the calf, or even near the ankle. Low down, the operation is frequently performed with a flap.



situation, is performed in a very similar manner to the same operation on the thigh, unless it be necessary to remove the limb above the insertion of the deltoid muscle.\*

The patient may either sit on a chair, or lie near the edge of a bed, and an assistant is to hold the arm in a horizontal position, if the state of the limb will allow it. The pad of the tourniquet is to be applied to the brachial artery, as high as convenient. The assistant is then to draw up the integuments, while the surgeon makes the first circular incision. In this operation, the skin need only be detached from the muscles to a very trivial extent, as there is no risk of not having sufficient flesh and integuments to cover the bone. When the muscles, in front of the arm, are to be divided, the elbow should, if possible, be bent by the assistant who holds the arm, and if the joint were quite movable, the limb might be placed in a straight posture, when the division of the triceps is to be effected. It is best to divide the biceps first, and after the retraction of this loose muscle, to cut the brachialis internus, which is fixed to the bone, by an incision sloping obliquely upward.

The triceps may be cut through at once, by one sweep of the knife, with its edge turned obliquely upward. The other proceedings do not require description, after the account already given, of what is necessary in amputating the thigh.

When it becomes indispensable to amputate the arm very high up, there is no room for the application of the tourniquet. In this instance, the subclavian artery is to be firmly compressed, as it passes over the first rib, by an assistant, who can most effectually accomplish this important object, by pressing the vessel from above the clavicle with the handle of a key, or any other suitable instrument. The danger of a sudden profuse hemorrhage having been thus guarded against, the operation is to be done variously according to circumstances. When the bone can be sawn through below the insertion of the pectoralis major, there is no peculiarity in the method of operating. But, if it be necessary to take off the limb still higher up, the circular incision is not adopted. Here some surgeons make a flap of the deltoid muscle, and commence with making an incision corresponding to its margin in shape and situation. Then the muscle is to be detached from the bone beneath, so as to form the flap, which is to be turned up. The operation is now finished by cutting through the other soft parts, from one side of the base of the flap to the other.

Instead of making a short stump, when the arm must be taken off very high up, Larrey thinks it more advisable to amputate at the shoulder-joint. He says, that if the humerus is

\* Sabatier, Médecine Opératoire, tom. iii. p. 242.

sawn through higher than the insertion of the deltoid muscle, the stump becomes retracted towards the arm-pit by the pectoralis major and latissimus dorsi; the ligatures on the vessels irritate the brachial plexus of nerves; great pain and nervous twitchings are apt to be excited; tetanus is frequently brought on; the stump is affected with considerable swelling; and at length, an anchylosis of the shoulder follows.\*

According to the experience of Mr. Guthrie, when amputation is attempted at the insertion of the pectoralis major, the bone will mostly protrude after a few dressings; and, frequently, a disagreeable and painful stump be the consequence. The artery is also liable to retract into the axilla, where it cannot readily be taken up. In cases of this description, instead of amputation at the shoulder-joint, Mr. Guthrie advises the following operation: "Two incisions of a similar shape are to be commenced, one or two finger's breadth below the acromion, as the case may require: the point of the inner one, instead of ceasing, as in the operation of the shoulder, a little below the pectoral muscle, is to be carried directly across the under part to meet the point of the outer incision; so that the under part of the arm is cut by a circular incision, the upper in the same manner as in the operation at the shoulder. These incisions are only through the skin and cellular membrane, which have liberty to retract, but are not to be turned up. The deltoid and pectoralis major are then divided close to the inner incision, and the opposite portion of the deltoid, with the long head of the biceps on the outside, to the extent of the outer incision. A half-circular cut on the under part, in the line of the skin down to the bone, clears it underneath, and shows the artery retracting with its open mouth, which is at this moment advantageously pulled out by a tenaculum, and secured." The flaps are then held asunder, and the bones sawn, &c.†

I should conceive that either this method of operating, or that previously mentioned, which appears to me more simple, ought to be preferred to taking the humerus out of the glenoid cavity, when the nature of the disease or injury does not render it absolutely indispensable.

#### AMPUTATION OF THE FOREARM.

The forearm is to be amputated as low as the case will allow. The tourniquet is to be applied a little above the condyles of the humerus, with its pad on the brachial artery, at the inner edge of the biceps muscle. While one assistant holds the hand, another is to take hold of the forearm, above the place where

\* Mémoires de Chirurgie Militaire, tom. iii. p. 53, &c.

† Guthrie on Gun-shot Wounds, p. 340.

the first circular wound is to be made. Thus, in conjunction with the former, the latter will be able to fix the limb in a proper manner, and, at the same time, draw up the integuments. After the amputating knife has been carried round the limb, the skin is to be detached from the fascia, a little way upward. The muscles are then to be divided obliquely upwards with the common knife, as long as this will do what is to be done with convenience, and the catling is afterwards to be employed for completing the division of the soft parts, between the radius and ulna. The retractor is to be applied, and the bones sawn, with the hand in the state of pronation.

In general, only four vessels require ligatures, viz. the radial, ulnar, and two interosseous arteries.

Larrey thinks it advantageous to take off the forearm in its fleshy part, notwithstanding the nature of the disease, or injury, would admit of the operation being done towards the wrist. However, as I have amputated several forearms near to the wrist, and the stumps healed in the best way, I see every reason for still adhering to the old good maxim of saving as much of the limb as possible. The cause of the bad success, which many of the French surgeons have had after amputating in the tendinous part of the forearm, has been correctly referred by Mr. Guthrie to their prejudices against the attempt to heal the stump by the first intention.\*

In the lower part of the forearm, Mr. Guthrie† prefers making two flaps; a method, which another surgeon‡ particularly recommends, in amputating the more fleshy part of the member below the elbow. I see no reason for deviating in either situation from the ordinary method.§

#### AMPUTATION AT THE SHOULDER JOINT.

The loss of blood is to be prevented, by compressing the subclavian artery, in the way mentioned in the account of high amputations of the arm. With a large common bistoury, a semicircular incision is to be made, with its convexity downward, across the integuments covering the deltoid muscle, about four inches below the acromion.|| The skin is not to be detached: but the surgeon is to proceed immediately to raise the muscle from the bone, quite up to the joint. If the circumflex arteries bleed considerably, they are now to be tied, before the

\* On Gun-shot Wounds of the Extremities, p. 370.

† Ibid. p. 372.

‡ Klein's *Practische Ansichten der bedeutendsten Chirurgische Operationen*, p. 45. 1st Heft. 4to. Stuttgart, 1816.

§ See NOTE W.

|| The horns of the semicircle, if I may use the expression, are to extend upwards along the anterior and posterior margin of the deltoid muscle.

operator proceeds further. Then the surgeon should cut the tendons passing over the joint, and, also, the capsular ligament, so as to be enabled to dislocate the head of the bone. With one stroke of the amputating knife, he is then to divide the skin, muscles, and other parts underneath the joint, and thus complete the separation of the limb. The axillary artery should be instantly taken hold of with the fingers, or forceps, and tied.

The flap of the deltoid muscle is next to be laid down, and its edge will then meet the lower margin of the wound.

The preceding method of operating was first practised by De la Faye, and is one of remarkable simplicity, as I can truly affirm, not only because I have tried it myself, but seen it done on several occasions by other surgeons. The last case, in which I was requested to give my assistance, was a patient of Dr. Blickes, of Walthamstowe: the operation was done as a last resource for a spreading mortification of the arm, from external violence; and though the man survived only about a fortnight, nothing could be more easy than the operation itself, and it was impossible to have had a better stump.

In order to make a flap of the deltoid muscle, some operators prefer first pushing a catling, or long straight double-edged knife, through the muscle, near the joint, and, next cutting downwards, they detach as much of the flesh from the bone, as they consider necessary; the flap is then turned up; the tendon of the long head of the biceps divided; and the operation finished, as already described. It was in this manner, that Loder chose to perform the operation.\*†

\* *Chirurgisch-Medicinische Beobachtungen*, b. i. p. 11. 8vo. Weimar, 1794.

† { M. Lisfranc performs it in the following manner:—"Supposing the left extremity is to be removed, the patient is placed on an elevated seat, one assistant pressing the artery above the clavicle on the first rib, whilst another draws the arm forwards. The operator standing behind the patient, with a long bladed catling, pierces the integuments on the inner edge of the latissimus dorsi muscle, opposite the middle of the axilla, and pushes it obliquely upwards and forwards, till its point strikes against the under surface of the acromion; then by raising the handle of the knife, its point is lowered, and protruded just before the clavicle, at the part where it joins the acromion. He then, by cutting downwards and outwards, forms a flap from the superior and posterior part of the arm, including the whole breadth of the deltoid muscle, and a part of the latissimus dorsi. This being held back by the assistant, the joint is cut through by passing the knife between its articulatory surfaces from behind forwards, and a corresponding flap is formed by cutting downwards and outwards between the muscles and bone on the inner side of the arm. The vessels being tied, and the flaps placed in contact with each other, the operation is finished.

"In operating on the right side, the patient should be seated on a low chair, and the catling thrust from above downwards, introducing it just before the point where the clavicle is connected to the acromion, and raising



Nothing, however, exhibits more strikingly the absurdity of generalizing too much even upon the subject of amputation, than the fact, that excellent as the preceding flap-operation is for the shoulder, the exclusive preference to this method, as declared by some writers, has been made without reflecting, that, in many of the examples in which amputation at the shoulder is indicated, the middle and upper portion of the deltoid muscle is very much lacerated, or more or less of it is actually torn away. Under such circumstances, a sufficiency of soft parts for making the flaps must be saved at the anterior and posterior sides of the shoulder; which plan, modified and executed in various ways, is approved of by a considerable number of excellent surgeons, even where circumstances leave a choice of this, or the foregoing method. On the other hand, in certain other cases, there is no possibility of making the flap on each side of the joint. Favourably as I have spoken of the mode of making a single flap of the deltoid, I do not consider it a matter of great importance, whether that operation, or the other above spoken of, be selected, where circumstances offer a choice; for, both methods have now been rendered extremely simple and perfect.

As I have explained in the chapter on gun-shot wounds, the necessity for amputation at the shoulder joint may often be removed, and the limb be preserved, by the performance of a less severe and mutilating operation, which consists in merely making an incision for the extraction of the diseased, or splintered head of the humerus, and, if necessary, of the adjoining part of the scapula. The arm is afterwards to be properly supported in a sling, so as to keep the upper end of the humerus as high as possible. It was in an example, where the head of the humerus was diseased, that this judicious practice was first adopted by Mr. White;\* and Larrey, in the Egyptian campaign, superseded, in not less than ten instances, the necessity of amputating at the shoulder, by the complete and immediate extraction of the head of the humerus, and its splinters.†

#### AMPUTATION OF THE FINGERS AND TOES.

The operation may be done in various ways. Sometimes a small semilunar incision is made on the back of the finger or toe to be amputated, extending across the part with its greatest convexity about half an inch beyond the joint. The flap is next

the hand as it is thrust backwards and downwards, till it appears on the inner edge of the latissimus dorsi, when the flap is to be formed, and the operation continued as before.”}

\* Cases in Surgery.

† Relation Chirurgicale de l'Expedition de l'Armée d'Orient en Egypte, &c. p. 315.

raised, and reflected. The skin on the other side directly opposite the joint, is divided by a second cut, extending across the finger, or toe, and meeting the two ends of the first semilunar incision. The joint is now bent, and the capsular ligament opened. One of the lateral ligaments is then divided, which allows the head of the bone to be dislocated, and the surgeon has nothing more to do, than to cut such other parts, as still attach the part, about to be removed, to the rest of the limb. When the arteries bleed profusely, they must be tied; but, in general, the hemorrhage will stop without a ligature, as soon as the flap is applied to the end of the stump, and the edges of the wound have been brought together with adhesive plaster. Of the plan of stopping the bleeding by pinching the vessels, sometimes recommended, I can say nothing from my own experience.

Lisfranc amputates the second or third phalanx of a finger in the following manner: he bends it, and observes the small lateral fissure in the integuments, directly behind the joint. Here the first incision is made, which lays open the point, by dividing the integuments and ligaments on the sides and dorsum of the finger, from left to right. In cutting the ligaments at the sides, the edge of the bistoury is directed towards the end of the finger; but, in cutting those on the dorsal side of the joint, it is turned in the opposite direction. The under portion of the capsular ligament is then cut through, and, with the knife directed horizontally, a sufficient flap is made by cutting between the integuments and bone.\* When the part cannot be bent, Lisfranc first forms a flap on the palmar side of the finger, by pushing a bistoury through it under the integuments, and cutting forwards and outwards: the operation is then finished nearly in the way of the flap-operation sometimes performed in England, and already described.

Some surgeons, who consider it unnecessary to make a flap, draw the integuments a little up, and then divide them in a circular manner. When the integuments are not diseased, quite enough of them may thus be preserved for covering the bone.

In amputating the metacarpal bone of the thumb, the surgeon should place it in the state of abduction, and make an incision at the mid-point between it and the metacarpal bone of the forefinger. The cut is to be continued down, until the knife touches the os trapezium, when its point is to be turned towards the joint, and the capsular ligament opened. The knife is to be carried through the joint, the head of the bone pressed towards

\* See Averill's Operative Surgery, p. 111.

the hand, and a flap formed at the side of the bone, by cutting in the direction away from the trapezium.\*

A formal dissection of the metacarpal bones of the fingers, away from their articular connexion with the carpus, is now rarely performed, because they may always be easily cut through at any point with Mr. Liston's bone-nippers.

When it is necessary to remove the metatarsal bone of the great or little toe, it is better to saw off the diseased portion, than to cut into the joints of the tarsus. Sufficient skin should be saved for covering the bone, and when the saw is used, the adjoining soft parts must be defended from injury by a piece of pasteboard, placed between them and the teeth of the instrument. The division of the bone may also be very conveniently performed with Mr. Liston's bone-nippers.

## CHAPTER LXI.

### PARONYCHIA, OR WHITLOW,

Is a very painful inflammation at the extremity of one of the fingers, or at the root, or sides, of the nail, slowly, but almost certainly, terminating in the formation of an abscess. Frequently, it extends gradually upwards to the hand, or even the wrist. I believe the varieties of whitlow are all referrible either to their depth, their extent, or their violence, some allowance being made for the effect of the patient's state of health upon the local disease. The generality of writers notice four kinds of whitlow; the first is situated under the cuticle, near the root, or side of the nail; the second, in the cellular membrane under the cutis: the third, in the sheath of the flexor tendons; and the fourth, between the periosteum and bone. In severe cases, the throbbing of the arteries extends a considerable way up the arm, and the febrile symptoms run high; particularly when the abscess passes extensively up the limb, along the sheaths of the flexor tendons.

In ordinary cases, as Dr. Gibson has observed, a pungent, deep-seated pain is felt in the end of the finger, soon followed by considerable swelling. The pain increases with great rapidity, and in a little time becomes so intolerable, that the patient is sometimes kept awake by it for whole days and nights

\* Op. cit. p. 115.

together. Even delirium and death have been known to be caused by this apparently trivial complaint. Although the progress of the inflammation is rapid, the suppurative process is so slow, that a long time frequently elapses, before a fluctuation can be perceived, and, even after matter is formed, it is so confined by fasciæ and tendinous sheaths, that it cannot make its way to the surface. Hence, it spreads extensively and deeply; the bones often suffer necrosis; and the tendons and muscles are separated from each other, and completely undermined. Sometimes, the ravages of the disease do not extend beyond a single phalanx; at other times, the whole finger is destroyed, and several of the contiguous joints in succession.\*

Whitlows frequently originate from external causes; as bruises, pricks of needles, the lodgment of thorns, or bits of broken glass, &c., but still more commonly, the inflammation takes place without any manifest cause. Whitlows are considerably more frequent in young persons than adults; yet, some grown up, and even elderly persons, seem peculiarly liable to these troublesome abscesses. These facts clearly imply the possibility of a certain state of the constitution having a share in the production of the local complaint.

The formation of matter in cases of whitlow, though generally unavoidable, is not productive of relief; but, on the contrary, the patient's sufferings are greatly increased, by its accumulation and confinement. The aim to promote suppuration, therefore, is only right, on the principle of bringing the case to that state, in which speedy relief may be afforded by opening the abscess. The extent and violence of whitlows may be checked by applying to the part affected, in the early stage of the complaint, leeches, and astringent applications, and having recourse to other antiphlogistic means. In severe cases, where the swelling reaches up to the arm, and the fever is considerable, venesection should be freely practised, aperient medicines given, opium exhibited, cold lotions applied, and leeches repeatedly used. Brandy, ether, camphorated spirit of wine, ice, camphorated oil, vinegar, linseed oil, and soft soap, have been recommended as good applications to whitlows, previously to suppuration, and as even capable of sometimes bringing about resolution. In particular, early and repeated blistering of the inflamed part is said frequently to have had the latter effect.† When these plans fail, and the increase of the swelling and pain denotes the impossibility of preventing an abscess, poultices and fomentations are to be employed, until the matter admits of being discharged by a free incision, which is the principal

\* See Gibson's Institutes, &c. of Surgery, vol. i. p. 223.

† Vol. cit. p. 225.



means of relief, and ought to be practised as soon as the existence of the abscess is ascertained. When the inflammation is somewhat abated, common dressings are to be substituted for poultices, which, if continued too long, do harm by relaxing the sore, and thickening the cuticle. Sometimes, the cure requires the removal of the nail, or of dead portions of bone; and sometimes the application of lunar caustic, or strong stimulating dressings, to repress fungous granulations, or convert the unhealthy sluggish action of the sore into a process favourable to cicatrization. Equal parts of balsam of copaiva and tincture of opium have been recommended.\*

## CHAPTER LXII.

### VENESECTION.

IN whatever part of the body venesection is to be practised, it is necessary to make pressure on the vein, betwixt the place where the puncture is to be made, and the heart. Thus the return of blood through the vessel is prevented; consequently it swells, becomes conspicuous, and bleeds freely, which it would not do if the blood could readily pass on towards the heart.

In bleeding in the arm, a fillet, or bandage, is to be tied, with moderate tightness, round the limb, a little above the elbow, to intercept the passage of the blood through all the superficial veins, without obstructing the circulation through the artery, which would evidently prevent the veins from being rendered turgid.

The surgeon, before putting a ligature round the arm, should ascertain precisely the situation of the pulsation of the artery, and, if equally convenient, he should not open the vein immediately over it. It is also proper to attend to the situation of a pulsation, on account of the occasional varieties in the distribution of the arteries of the arm. The ulnar artery is sometimes given off from the brachial high up; and, in this case, it fre-

\* { When the affection exists around the root of the nail, the application of lunar caustic, in the earlier stages, is strongly recommended by Mr. Higginbotham. When the inflammation is deep seated around the theca and tendons, many surgeons advise early and free incisions down to the bone, so as to relieve the tension caused by the swelling. See Dr. Craigie's paper in *Edinburgh Med. and Surg. Journal*, for 1828. }

quently proceeds superficially over the muscles, arising from the internal condyle, instead of diving under them, in the ordinary manner.

In general, it is best to select a vein which rolls least under the skin. Such a vessel, though sometimes less superficial than another, may be more easily opened. However, the operator is always to fix the vein, as much as he can, by placing the thumb of his left hand a little below the place where he intends to introduce the lancet.

More depends on the mode of using this instrument, than on its shape. It should be pushed into the vein in an oblique direction, and, when its point is a little within the cavity of the vessel, it is not to be introduced further, but the opening is to be rendered sufficiently large, by carrying the front edge of the lancet obliquely forward and upward, by which movement it is also brought out of the part again. In cases of herniæ, dislocations, &c. it is often a great desideratum to make a free opening, in order that the sudden evacuation of blood may make the patient faint. The puncture being made, the patient is to support his arm, in a convenient position for allowing the blood to flow into a basin, by taking hold of a stick, which he may turn round and round in his hand, in order to put the muscles into action, and make the blood flow out in a freer current. Sometimes, however, it escapes so readily, that there is no occasion for the muscles of the arm to be exerted. When the patient is so circumstanced, that he cannot keep his arm in the right position himself, the surgeon, or assistant, is to support the arm; and, if the vein should not bleed freely, he is to desire the patient to take hold of any small body, and move it about in his hand, so as to put the muscles of the forearm into action.

The due quantity of blood having been taken away, the ligature is to be loosened, and removed. The stream of blood now generally ceases, and always does so, when the surgeon places the thumb of his left hand just below the orifice. The arm in this state is to be washed with a sponge, and dried. The edges of the wound are to be placed in contact, and kept so by a small compress of lint, which is to be bound on the part, by applying the bleeding fillet round the arm, in the form of a figure of eight. The bandage is to meet and cross in front, exactly over the dossil of lint.

When the external jugular vein is opened, the surgeon makes the necessary pressure with his thumb. The orifice should be made in the direction of the fibres of the platysma myoides muscle, and the vein is less apt to glide out of the way, when the surgeon opens the vessel, just where it lies over some part of the sterno-cleido-mastoideus.

The temporal artery, and its branches, are the only vessels, in which surgeons now ever perform arteriotomy. When the branch is superficial, it may be punctured at once; but, in other cases, it is best first to make a small incision through the integuments. After the due quantity of blood has been taken away, the bleeding may usually be stopped, by means of a roller and compress. When the hemorrhage after the operation proves troublesome, some surgeons recommend cutting the vessel completely across, in order that it may retract.

## CHAPTER LXIII.

### PARTICULAR FRACTURES.

#### FRACTURE OF THE OSSA NASI.

THE lower part of these bones being most exposed to violence, is most liable to be broken. The two bones are not always fractured together: sometimes one is broken all across, while the other, without having suffered any solution of continuity, is either elevated or depressed. Falls, or blows on the face, are the usual causes of the accident, and hence, the soft parts are generally at the same time either very much contused, or wounded. These cases are often attended with a fracture of the perpendicular lamella of the os ethmoides, which process is thrown more or less to one side or the other. The accident is commonly followed by inflammation of the pituitary membrane; swelling of the nose and adjoining parts of the face; ophthalmy; and a great deal of hemorrhage from the nostrils, through which the breathing is more or less obstructed. The blow, which breaks the ossa nasi, may also produce a concussion of the brain; an extravasation of blood within the cranium; or, if we can believe some accounts, pressure on the brain, from the crista galli being driven inward.

The displaced portions of bone are to be raised, or depressed, to their proper level, by introducing a strong probe, or female catheter, up the nostril, and moving the pieces of bone into their proper position, by means of the combined operation of the probe, or catheter, on the inside, and of the fingers, on the outside of the nose. If the perpendicular process of the os ethmoides should be forced to one side, it is to be replaced with a probe, as well as circumstances will allow. If the crista galli

were driven inward, so as to press upon the brain, the surgeon might gently endeavour to draw down the vomer and perpendicular lamella of the ethmoid bone, by means of a director, passed up into each nostril. I believe, with Delpech, that such a case is very uncommon, and that when the brain is injured, it is generally, not from any displacement of the crista galli, but from the concussion or blow itself.

The ossa nasi, when duly replaced, are not liable to be drawn out of their proper situation by the action of any muscles. When the broken pieces have a propensity to fall inwards, some authors talk of supporting them by dossils of lint, smeared with any softening ointment, and introduced up the nostrils, or of employing tubes with a similar intention: but all practical surgeons consider these contrivances more likely to cause irritation, than to be of any real service. The indications, therefore, must be limited to some discutient application, and general antiphlogistic remedies.

#### FRACTURES OF THE LOWER JAW-BONE.

This bone may be fractured either in its body, or rami, on one side or both; at the neck of one of the condyles, or near the symphysis. According to Delpech, the fracture is never situated exactly at the symphysis itself; but this remark is incorrect, with respect to children; and it has been noticed in one instance in a man beyond forty years of age.\* The injury may be either a single solution of continuity, or a comminuted fracture, that is to say, a case in which the bone is broken into several pieces.

Fractures of the jaw admit very well of a general division into those which occur between the symphysis of the bone and the insertion of the masseter, and which may be called fractures of the chin; those, which happen at some point between the same insertion, and the coronoid process, and which may be termed fractures of the angle; and others affecting the neck of the condyle.

As the lower jaw-bone is strong and movable, it cannot be broken without a good deal of violence, traces of which are almost always left in the soft parts.

When the fracture is towards the chin, whether the bone be broken on one side or both, the fragment, comprehending the symphysis, is drawn downwards. If the fracture extend obliquely downwards and backwards, this sort of displacement is very considerable.

On the other hand, both sides of the lower jaw, between the

\* See Operative Surgery, by C. Bell, vol. ii. p. 219. 8vo. London, 1809. Gibson's Institutes, vol. i. p. 381.



insertion of the masseter, and the angle of the bone, as well as the coronoid process itself, are covered by muscular attachments. Hence, fractures in this extent of the bone, are liable to little displacement, the pterygoid, temporal, and masseter muscles here opposing the tendency of the digastric and other muscles to draw down the part of it in front of the fracture.

When the neck of the condyle is fractured, the condyle itself may be displaced forwards by the action of the external pterygoid muscle.\*

A fracture of the lower jaw may be detected by introducing a finger into the mouth, and pressing on the front teeth of the side on which the fracture is supposed to be, while the fingers of the other hand are applied to the basis of the bone, near the angle. On making alternate pressure in these situations, the bone may be felt to move, and a crepitus be distinguished. This painful mode of examination, however, is not invariably requisite; for when the fracture is displaced, the nature of the accident is rendered manifest by the body of the bone being drawn down from the rami; the mouth being more or less open, and so distorted that the commissure of the lips is much lower on the injured side than the other; while the front teeth are below the level of the molarés; and the regularity of the arch, formed by the teeth and alveolar process, destroyed.

When the fracture is not displaced, the surgeon need only adapt some pasteboard, wet and softened with vinegar, to the outside of the jaw, both along its side, and under its basis. Over this wet pasteboard, a bandage with four tails is to be applied, the centre being placed on the patient's chin, the two back tails pinned to the front of his night-cap, and the two anterior to the back of it. When the pasteboard becomes dry, it forms a convenient apparatus for supporting the fracture.

When the symphysis is drawn below the level of the base of the jaw behind the fracture, the coronoid process is to be gradually pushed backward with the forefinger of one hand, while the fore and middle fingers of the other hand are to be applied to the front teeth, and the thumb to the basis of the anterior part of the jaw. At the moment when the coronoid process is pushed backwards, the front portion of the bone is to be raised and inclined forwards. When one end of the fracture is situated over the other, the two parts of the bone are to be pushed in opposite directions, and if this be skilfully done, the slightest pressure on the extremities of the fracture will suffice for placing them in contact.

That the fracture is well reduced, may always be readily

\* Delpech, Précis des Mal. Chir. t. i. pp. 232-235.

known by adverting to the evenness of the dental line, and that of the base of the jaw.

When any teeth are driven out of their sockets, they should be immediately introduced again, and, if necessary, tied to the adjoining teeth, by means of a piece of catgut, or gold wire. However, when the displaced tooth belongs to the very situation at which the fracture has occurred, it is generally thought most advisable to remove it altogether.

The surfaces of the fracture having been placed in even contact, the jaw is to be covered with pasteboard, and the four-tailed bandage applied. It will also be necessary to counteract the action of muscles, between the lower jaw and os hyoides, by supporting the front portion of the bone with compresses placed under the bandage.

In the treatment of these cases, I have not found it necessary to interpose any substance between the teeth; a method also represented by Gibson as needless.\* Several practitioners recommend this plan for various, and (as they suppose) good reasons. Thus a modern writer observes, "if the teeth be very regular, and those of the upper and lower jaw correspond, those of the upper jaw serve the purpose of secure splints, when the base of the jaw and chin are bandaged. If the patient had lost a tooth previously, and when the pieces of the broken jaw are brought together, there is a deficiency or irregularity in the teeth, then a piece of cork may be adapted to the teeth of each side, in such a manner as to serve the purpose of a splint."† Here the intervention of cork is approved of, on the principle of its affording an even surface, against which the line of teeth in the lower jaw may rest. And as Mr. Bell thus advises the practice, when the teeth are defective and irregular, and in the next page, when they are so perfect, as to leave no interstice through which the food can be put into the mouth, he is to be considered as an advocate for this method in all cases.‡

When the neck of the condyle is broken, little more can be done, than keeping the bone steadily supported with a four-

\* Institutes of Surgery, vol. ii. p. 384.

† Operative Surgery, vol. ii. p. 221. 8vo. Lond. 1809.

‡ { In a very bad double fracture of the jaw, which had remained ununited and displaced nearly three months under the care of other surgeons, my brother succeeded in restoring the fragments to their proper position, by the use of a silver band placed in front of the teeth and fastened on both sides, as well as to the intercepted and loose portion of the jaw, by loops of wire twisted tightly around the teeth. Bandages and external dressings had all acted injuriously in this case, by forcing the fragment which was intercepted between the two fractures into the cavity of the mouth. Soon after these were laid aside, and while the silver band was alone depended on, the fractured surfaces began to reunite; and in less than a month the parts were perfectly consolidated. }

tailed bandage. The extreme part of the condyle, after separation from the rest of the bone, has sometimes been destroyed by necrosis.

Sometimes the artery, running in the *canalis mentalis*, is ruptured, and the hemorrhage copious. I have never seen a case, however, in which the bleeding did not cease as soon as the surfaces of the fracture were placed in contact.

The patient must avoid talking, and keep the jaw as quiet as possible. His food should be soft, so as not to require mastication, and it ought to be put into his mouth with a small teaspoon. In very bad cases, all nourishment and medicines might be introduced into the stomach through an elastic catheter passed through one of the nostrils, by which means the hurtful movement of deglutition would be avoided.

The lower jaw-bone being highly vascular, its injuries are generally repaired with surprising quickness. In adults, three weeks commonly suffice for the union of its fractures; and in children, a fortnight. In compound, or comminuted fractures, however, necrosis of large portions of the bone sometimes ensues, and the exfoliations take up considerable time. Sometimes, after fractures of the chin, various nervous symptoms, and paralysis of certain muscles of the face, are the consequence, owing to injury done to the inferior maxillary nerve. In one case, where the patient had been carried off by fever, delirium, convulsions, &c., Flajani dissected the parts, and found the nerve lacerated just at its exit from the *canalis mentalis*.\*

#### FRACTURE OF THE CLAVICLE.

The exposed situation, and natural slenderness of this bone, render it very liable to be broken, either at its middle, its sternal, or its scapular extremity. Its middle part, however, where its curvature is greatest, most frequently suffers.

Fractures of the clavicle, besides being oblique, or transverse, may be divided into two different kinds, according as they happen to be situated at some point between the coracoid process of the scapula, and the sternal extremity of the clavicle; or more towards the scapular end of the bone.

The first case is most frequently the consequence of a fall upon the outer part of the shoulder, or upon the palm of the hand; for, the clavicle receives the impulse of every force, applied to the upper extremity. The second case is generally produced by a blow inflicted directly on the part, and is attended with little displacement. On the contrary, in the other ex-

\* Flajani, *Collezione d'Osservazioni e Riflessioni di Chirurgia*, tomo iii. p. 167. Roma, 1802.

ample, the displacement is very conspicuous; being caused by the weight of the arm, and the action of the pectoralis major and latissimus dorsi. Hence, the shoulder is depressed and drawn nearer to the trunk; the arm falls downwards and inwards; and the inner end of the fracture projects, partly in consequence of the action of the sterno-cleido-mastoideus, but chiefly from the descent of the external portion of the bone below it, in the direction downwards, inwards, and forwards.

Fractures of the clavicle are not commonly attended with any bad symptoms, arising from the injury of the neighbouring parts by the fragment of bone: at least, the cause is generally exempt from any evils of this kind, when the accident has been produced by some force applied to the arm, or outer part of the shoulder. When, however, the violence has been directed immediately against the bone, and has had a share in increasing the displacement of the fragments, the external portion may be forced against the axillary vessels and nerves; its point be driven through the integuments; or a spicula prick the lungs, so as to produce emphysema.

The symptoms of a broken clavicle are, pain at the injured part; impossibility of raising the hand to the head; the hanging of the arm close to the side, rotated inwards; the fall of the shoulder and its inclination towards the median line of the body; the tendency of the head towards the injured shoulder; the patient's supporting the weight of his arm with his other hand; the projection of the internal fragment upwards and backwards; the situation of the external one below it, directed downwards and forwards; the restoration of the natural position of the shoulder, by taking hold of the upper part of the humerus, and carrying it upwards, backwards, and outwards, which manœuvre also puts the ends of the fracture in due contact, and sometimes produces a crepitus; and, lastly, the return of the displacement immediately the arm is left unsupported.

In the treatment, the indications are to keep the shoulder elevated, inclined away from the trunk, and, at the same time, drawn backwards. Indeed, as the extremity of the internal fragment is pulled somewhat upwards by the sterno-cleido-mastoideus, the shoulder should be raised even higher than natural. The apparatus should completely take off the weight of the arm, and continually act with an equal force, so as to keep the shoulder regularly in one position; while the parts with which the clavicle is articulated should be kept perfectly motionless.\*

It must be acknowledged, that the completion of all these objects is attended with considerable difficulty. However, the

\* Delpech, *Précis des Maladies Chir.* t. i. p. 248.



plan adopted by Desault, fulfils each indication nearer than any other method hitherto devised, and, consequently, ought to be preferred to the common practice of our hospitals.

In these, the principal reliance is placed upon the effect of a sling for supporting the arm, and upon a figure-of-eight bandage, with which the shoulders are braced back, a bit of soap-plaster being usually applied over the fracture under the bandage, and some tow, or other soft materials, interposed between the margins of the axillæ and the turns of the roller, in order to prevent chafing. An assistant is first directed to draw the shoulders firmly back, while another assistant keeps the arm and shoulder steadily raised. The surgeon then examines, whether the ends of the fractures are brought together, and if they appear to be so, he applies the piece of soap-plaster to the skin over the fracture, and then the figure-of-eight bandage. Lastly, the elbow and forearm are supported in a sling.

The figure-of-eight bandage is not altogether well calculated for fractures of the clavicle, particularly such as are attended with displacement. The outer portion of the bone is thrown downward and forward, and is already situated too much inward, in which latter direction the bandage must push it still further. Hence, the advantage of placing a thick, wedge-shaped cushion, just under the arm-pit, with its broad end upwards, and keeping the elbow closely confined by the side of the body, in the manner practised by Desault.

#### FRACTURES OF THE SCAPULA.

When the acromion is broken, the solution of continuity mostly happens across its base. The external fragment is drawn downwards by the weight of the arm, through the medium of the deltoid muscle. The displacement, however, is not very considerable, amounting merely to a simple inclination of the point of the bone downwards; a change, which may be rectified either by raising the arm from the trunk, or elevating it in a parallel line to its axis. The head of the humerus sinks towards the axilla, as far as the capsular ligament will permit, part of the attachment of the deltoid being broken off. The distance between the extremity of the shoulder and the sternal end of the clavicle is diminished; a depression is felt just where the fracture is situated; and a crepitus is manifest when the head of the humerus is pushed up, and rotated.\*

The treatment of fractures of the acromion consists in keeping the humerus close to the side, raised in a line parallel to its axis. Between the arm and the side, a cushion, thicker below than above, should be interposed, because a close approximation

\* See Sir A. Cooper on Dislocations, p. 418, ed. 4.

of the elbow to the body, has a tendency to bring on a displacement of the outer fragment of the bone, by rendering the deltoid muscle tense. The head of the humerus should be kept well up against the acromion, by means of a good sling, and a bandage, extending from the elbow on the injured side, over the opposite shoulder. Delpech prefers keeping the patient quiet in bed, with the arm considerably raised on a pillow, so as to relax the deltoid; in which state, he conceives, that the fibres of the trapezius would act usefully in bringing up the outer piece of bone to a level with the clavicle.\* Fractures of the acromion most frequently unite by ligament.

A fracture of the neck of the scapula is very liable to be mistaken for a dislocation; for the glenoid cavity, being separated from the rest of the bone, falls towards the axilla, and with it the head of the humerus; the fulness of the deltoid is lost; a vacancy is felt under the acromion; and the head of the humerus is perceptible in the arm-pit. The nature of the case may be known by the facility of replacing the parts; their immediate descent again, when left to themselves; and the crepitus felt on touching the coracoid process, and rotating the humerus.† The best plan of treatment is to maintain the arm and shoulder well up, and to put a thick compress in the axilla, so as to keep the head of the humerus outwards, the elbow being confined close to the side with a bandage. In short, Desault's method of curing fractures of the clavicle, is here perfectly applicable.

Fractures of the body of the scapula are treated by keeping the arm perfectly quiet, applying a sling and the spica bandage, and having recourse to means for lessening the effects of the contusion of the soft parts. When the lower angle of the scapula is broken off, the action of the serratus major anticus in displacing it, is difficult to counteract. A thick compress, however, may be bound just in front of the fragment, and the motions of the arm are to be prevented with a sling or bandage.‡

In fractures of the coracoid process, the coraco-brachialis muscle should be relaxed, as a tense state of it would increase the displacement of the fragment. The humerus should therefore be inclined towards the sternum, and confined in this situation with a sling and a roller.

The spica bandage, sometimes employed in fractures of the scapula, is used rather for its neat appearance, than real efficacy. The middle of a double-headed roller is put under the arm-pit of the sound side; the ends are then carried obliquely

\* *Traité des Maladies Chir.* t. i. p. 242.

† Sir A. Cooper, *op. cit.* p. 421.

‡ Gibson's *Institutes*, vol. i. p. 406.

upwards over the breast and back to the injured shoulder, where they are to cross. They next cross under the subjacent arm-pit, whence they ascend to the top of the shoulder, and again crossing, follow the course already mentioned over the back, breast, and shoulder, once or twice more, the application being generally finished by a turn or two round the chest, including the arm, or not, as the circumstances of the case may require. In injuries of the scapula, this last proceeding of including the arm, and thus confining it close to the side, is the most useful operation of the spica bandage.

#### FRACTURES OF THE STERNUM.

The sternum being suspended, as it were, between the elastic cartilages of the ribs, cannot be easily broken: the accident is sometimes produced by violent blows, or the passage of the wheel of a carriage over the chest. When the bone is fractured, the thoracic viscera also generally suffer more or less injury. In some cases, the fracture consists of a single fissure; in others, the bone is broken in several places; and the fragments may be displaced by the same force which caused the injury.

Fractures of the sternum are most frequently transverse, and as its lower part, and the inferior ribs attached to it, have the greatest degree of motion, the lower fragment is often displaced, and being propelled forwards in inspiration, projects more than the upper one, and even overlaps it.

As the sternum is very superficial, its fractures are readily detected by manual examination; and, when the pieces are at all separated, the deformity is quite obvious. Respiration sometimes produces a crepitus, which the patient is conscious of himself, and the surgeon can easily perceive. A fixed pain is also experienced in the part, and is exasperated by the movements of breathing; while, in consequence either of the displacement of the fragments, or the contusion of the internal organs, the patient suffers great oppression, palpitations, and a troublesome cough. When the lungs are wounded by spiculæ of depressed bone, the patient coughs up blood, and emphysema may follow.\*

When a fracture of the sternum is attended with a depression of the bone, the urgent symptoms, thus produced, may require a prompt elevation of the part beaten inward. In this case, some writers recommend a considerable extension of the spine, by placing under the patient's loins a thick pillow. When this method fails, an incision is advised to be made down to the bone; and if the depressed portion of it cannot be raised

\* Flajani, *Collezione d'Osservazioni di Chirurgia*, t. iii. p. 214.

by means of an elevator, or the forceps, it is to be removed either with a trephine, or one of Mr. Hey's saws. Delpech conceives, that the employment of saws will scarcely ever be necessary, as the soft spongy texture of the bone would make it easy for the surgeon to cut, or scrape away, a part of the anterior fragment.

Fractures of the sternum being mostly complicated with injury of the thoracic viscera, are attended with risk of extravasation of blood in the chest, emphysema, inflammation of the lungs, abscesses in the anterior medias tinum, or necrosis of the injured bone itself. It is these latter effects, viz. abscesses and exfoliations, which more frequently call for the use of the trephine, than mere depressions of the bone.

If any cases in surgery demand copious venesection, fractures of the sternum, and injuries of the thoracic viscera, will be allowed to do so; indeed, the lancet should be used freely and repeatedly, according to the urgency of the symptoms; other antiphlogistic measures being also rigorously practised.

With respect to an apparatus for diminishing the movements of the ribs and broken sternum, the best is a broad roller tightly applied, or a strong napkin well laced round the chest.

#### FRACTURES OF THE RIBS.

The upper ribs are not often broken, on account of their guarded situation beneath the clavicle and shoulder; while the false ribs are seldom fractured, because by their great moveableness they elude the effect of external violence. The middle ribs are most frequently broken. When the force is applied by a broad surface, it is not uncommon for two or three of the ribs to be fractured. These injuries are rarely attended with any material displacement, the intercostal muscles tending to hinder a permanent separation of the fragments. The bone mostly breaks at its greatest convexity. The surgeon should place his hand on the part of the chest where a pricking pain is complained of, or where the blow has been received; and then the patient should be desired to cough, in which action the ribs undergo a sudden motion, and a crepitus is rendered preceptible. However, all the best practical surgeons are in the habit of adopting the same treatment, when there is reason to suspect a rib to be fractured, as when the injury is positively known to exist, by a crepitus, or an irregularity of the bone.

When the point of a fractured rib is forced inward, extravasation of blood, emphysema, and inflammation of the pleura and lungs, may be the consequences.

In the treatment, the principal indication is to render the injured bone or bones as motionless as possible. For this purpose a broad roller is put tightly round the thorax, or a piece



of strong linen, sufficiently large, is firmly laced round it. The patient should then be bled, and other antiphlogistic remedies adopted. If much cough prevail, the spermaceti mixture, with opium, may be exhibited.

The cartilages of the ribs are subject to fracture; and what is remarkable, the union is never effected through the medium either of a cartilaginous or any other soft substance, but of an osseous matter.\* The treatment is the same as that of a fractured rib.

#### FRACTURES OF THE VERTEBRÆ.

One or more of the spinous processes are sometimes broken, without the spinal marrow receiving any particular injury; but, other fractures of the spine are mostly attended with a train of dangerous symptoms, all the parts situated below the injured point being generally affected with partial or complete paralysis. As Mr. C. Bell observes, when the fracture is low, it is attended with loss of sensibility and motion in the lower extremities, and paralytic disorder of the bladder; when the injury is higher up, the abdomen becomes enormously distended with air collected in the bowels; when it is still higher, respiration is affected; and, when it is above the principal origin of the phrenic nerve, the breathing is stopped, and death suddenly follows.† With the exception of the spinous processes, the several parts of the vertebræ are so protected by their deep situation, that they cannot be broken without the application of immense violence, and hence the fracture is mostly accompanied with other injuries of quite a different nature, and sometimes even quite as surely fatal. Experience proves, indeed, that when the spine is broken, the accident is generally produced by the patient falling from a very considerable height, and the backbone striking with vast force against some hard projecting body. The violence not only breaks the vertebræ, and causes injury of the spinal marrow, but gives rise to a copious extravasation of blood in the cellular membrane, and even within the cavity of the abdomen, from rupture of the spleen, kidney, or other viscera.‡

If a fracture with displacement be below the fourth cervical vertebra, the functions of that nerve, the action of the diaphragm, and the breathing, are not abolished, so that life is not always immediately destroyed, unless additional mischief be done to other important organs. If the lumbar vertebræ be displaced, the lower extremities are so completely insensible,

\* Delpech, *Traité des Maladies Chir.* t. i. p. 238.

† *Surgical Obs.* vol. i. p. 150.

‡ See the fatal case recorded by Flajani, *Collezione d'Osservazioni di Chirurgia*, tom. ii. p. 231.

that they may be pinched, or burnt, without the patient being conscious of it, and the power of volition over the muscles is annihilated. The sphincter ani is paralytic, and the feces are involuntarily discharged. The bladder cannot contract, and the urine cannot be voided, without a catheter. The patient mostly dies in a month, or six weeks; but may live a considerable time, and ultimately perish of gangrene of the nates.\*

In cases of fracture and displacement of the dorsal vertebræ, the paralysis extends higher, and the abdomen becomes excessively distended with air. The patient rarely lives longer than two or three weeks; but Sir Astley Cooper saw one case where death did not happen till nine months after the accident.

Fractures of the cervical vertebræ, below the origin of the phrenic nerve, cause more or less paralysis of the arms, as well as of the lower parts of the body. The breathing is difficult, the intercostal muscles being paralytic. Great distention of the belly with air, inability to discharge the urine, or to retain the feces, occur, as in fractures of the dorsal vertebræ. Death generally follows between the third and seventh day.

On dissection, the spinous process of the displaced vertebra is found depressed, the body of the bone broken through, (rarely dislocated by laceration of the intervertebral substance) and projecting more or less forwards. Blood is extravasated between the vertebræ and sheath of the spinal marrow, and frequently on the latter part itself. In slight displacements, the spinal marrow is compressed and bruised; in considerable ones, it is generally torn through by the bony arch of the spinous processes, but the dura mater remains entire.†

Here I am disposed to think with a modern writer, that an incision through the skin and muscles covering the spine, and the withdrawing of a portion of the circle of bone which surrounds the marrow, would be inevitably fatal.‡ Where the patient is not quickly destroyed by the paralysis induced in the diaphragm and other important organs, or by the case being complicated with rupture of the kidneys, spleen, &c. and internal hemorrhage, I know of no treatment which holds out any prospect of efficacy, except the free use of general and topical bleeding, with a view of preventing inflammation, and suppuration within the spinal canal. Other antiphlogistic means will also be necessary, and above all things, the patient must be kept perfectly quiet in one position. The difficulty of voiding the urine is to be obviated by the catheter. Should the patient live long enough to justify the inference, that the fracture is united, though some of the paralytic effects of the injury still

\* See Sir A. Cooper on Dislocations, p. 510, ed. 4.

† Sir A. Cooper, op. cit. p. 513.

‡ C. Bell, vol. cit. p. 156.

remain, stimulating liniments, blisters, and issues,\* may be tried.

## FRACTURES OF THE PELVIS.

On account of the great strength, and deep situation of the bones of the pelvis, they are seldom fractured, and when they are, the violence is so considerable, that vast mischief is done both to the external soft parts, and the internal viscera.

The upper part of the os sacrum can rarely be broken, on account of its remarkable thickness; but, by great violence, it is sometimes disjoined from the ilium.

The ilium is more liable to fracture than any other bone of the pelvis. The rami of the ischium and pubes are also occasionally broken. Fractures of the os innominatum may be mistaken for dislocations of the thigh-bone; for, as Sir Astley Cooper remarks, when the injury extends through the acetabulum, the head of the os femoris is drawn upwards, and the trochanter somewhat forwards, so that the leg is shortened, and the knee and foot are turned inwards. If the os innominatum is disjoined from the sacrum, and the ossa pubis and ischium are broken, the limb is slightly shortened; but the knee and foot are not turned inwards. Such fractures may be known by a crepitus, which is felt on applying the hand to the crista of the ilium, and moving the thigh, which is less fixed than in a dislocation. In one example of fracture of the acetabulum, the head of the thigh-bone had sunk deep into the cavity of the pelvis.†

The pressure of the pelvis between a cart-wheel and a wall; the passage of a heavy wagon over it; falls from great heights against very hard bodies; and gun-shot violence,‡ are the ordinary causes of fractures of the pelvis. In some cases, the bladder is ruptured, and the urine effused, so as occasionally to be the cause of a fatal inflammation of the bowels and peritoneum.

In most cases, the fragments are not displaced, and of course no reduction is needed. Some surgeons apply a roller round the pelvis; others dispense with it. Rest, copious bleeding, fomentations, low diet, and every thing, calculated to prevent inflammation within the pelvis and abdomen, are to be rigorously put in practice. Here the ingenious beds, devised for

\* C. Bell, vol. cit. p. 160.

† Surgical Essays, part i. pp. 49–51, and Treatise on Dislocations, pp. 94–97, ed. 4.

‡ In the neighbourhood of Antwerp, I saw a case, in which the explosion of a shell broke the tuberosities and rami of the ischium, dreadfully mangled the soft parts, and fractured one of the thighs. The unfortunate patient, who was a private in the Guards, did not survive this dreadful injury more than twenty minutes. I have since seen another bad fracture of the pelvis, where the injury of the viscera, by the passage of a heavy wagon over it, caused death in about half an hour.

the purpose of enabling patients to empty the bowels, without any disturbance of change or posture, cannot be too much commended.

In most fractures of the pelvis, where the injury of other parts is not such as to destroy life in a very short time, the use of the catheter is indispensable. As the lower extremities are often paralytic, and the patient subjected to long confinement in nearly the same posture, too much care cannot be taken to prevent gangrene of the parts of the body on which he lies.

#### FRACTURES OF THE HUMERUS

Are distinguished, first into those which happen above the insertion of the deltoid muscle; secondly, into those which occur below that point; and thirdly, into others situated towards the lower end of the bone.

Fractures of the portion of the humerus, just below its tubercles, happen both in old and in young persons, but rarely in those of middle age. In the young, the epiphysis separates from the shaft of the bone. In either case, the upper fragment is drawn outwards by the action of the subscapularis and teres minor, while the lower one is pulled inwards by the latissimus dorsi and pectoralis major. At the same time, the weight of the arm, keeping down the lower fragment, prevents it from overlapping the upper.\* Sir Astley Cooper has recorded the particulars of an interesting case, in which the neck of the humerus was fractured within the capsular ligament, the tubercles remaining attached to the body of the bone; the union which followed was ligamentous.† Fractures of the upper part of the bone should be carefully discriminated from dislocations: when fractured, the head of the bone still remains in the glenoid cavity, but the shaft sinks into the axilla, where its extremity can be felt, and it draws down the deltoid muscle, so as to lessen the roundness of the shoulder. In a luxation, a hollow may always be felt under the acromion, and the head of the bone in the axilla, or under the pectoral muscle. In one case, a crepitus occurs; in the other, this symptom is absent.

The middle of the humerus is more frequently broken than any other part of it; and the nature of the case is rendered sufficiently plain by the flexibility of the limb in the situation of the fracture, the angular deformity, and the crepitus, which is always readily perceived.

The condyles of the humerus are sometimes obliquely broken off, just above the joint, and the accident may be mistaken for a dislocation of the radius and ulna backwards; from which

\* Gibson's Institutes, &c. vol. i. p. 407.

† On Dislocations, p. 411, ed. 4.



case, however, it may be distinguished by the crepitus felt on rotating the radius, and by the immediate return of the displacement after the reduction.\*

An oblique fracture sometimes detaches the internal condyle from the rest of the bone. The ulna appears dislocated from it, and, when the arm is extended, the condyle projects behind the humerus. When the arm is bent, the ulna resumes its natural situation. When the condyles are grasped, and the forearm bent and extended, a crepitus is felt at the inner condyle. Lastly, when the arm is extended, the lower end of the humerus advances upon the ulna. According to Sir Astley Cooper, from whom the foregoing particulars are borrowed, this accident is caused by a fall upon the elbow, and is most common in youth, before the epiphysis is perfectly ossified; but, he has seen it in old subjects. It is frequently mistaken for a dislocation.

Fractures of the external condyle are attended with a crepitus, during the rotation of the radius, and great difficulty of moving the elbow joint. When the portion broken off is large, it is displaced a little backwards, and the radius with it. The case is most frequently seen in children. Preparations in the museum at St. Thomas's hospital represent an union by means of a ligamentous substance.†

Fractures of the head and neck of the humerus, or of any part of it above the insertions of the great pectoral and latissimus dorsi muscles, are treated in the following manner: a roller is first to be applied from the elbow to the shoulder; a splint is then to be placed on the external side of the humerus, and a wedge-shaped cushion on its inner side, with the broad part upwards, or close to the axilla. By continuing the application of the rest of the roller downwards, the apparatus is fixed. The forearm is then to be supported in a sling, without the elbow being too much pushed upwards. The cushion near the armpit keeps the fracture steady far better than a splint, which here would have little power over the upper part of the bone.

When the middle portion of the humerus is broken, the forearm is to be bent, so as to relax the biceps, and gentle extension made by an assistant, who at once draws the lower portion of the bone downward, and supports the forearm, while the surgeon applies a piece of soap-plaster, and a roller. The outer splint is to extend from the acromion to the outer condyle, and to be lined with a soft pad. The internal splint is to reach from the margin of the axilla to a little below the inner condyle, and is also to be lined with a pad of tow, or other soft materials. Some surgeons are content with the application of

\* Sir A. Cooper on Dislocations, &c. p. 446.

† Op. cit. p. 450.

two splints; but, though the two above described are the essential ones, yet, as the cylindrical form of the arm conveniently allows it to be quite enclosed in splints, I see no objection to the employment of four; one on the outside, one on the inside, one on the front, and another on the back of the arm; all fastened in their respective situations with circles of double tape.

Although fractures of the humerus are generally cured with great facility, experience proves, that it more frequently fails to unite than any other bone, particularly when the fracture is oblique, and situated where the pectoralis major, latissimus dorsi, and teres major are inserted.

Sir Astley Cooper recommends a fracture, near the condyles, to be reduced by bending the forearm and drawing it forwards, in which position, a roller is to be applied. An angular splint, corresponding to the angle made by the humerus and forearm in the bent position, is to be applied to the inside of the limb, and a common splint to the front of the upper arm. These are to be secured with straps; an evaporating lotion used; and the forearm supported in a sling.\* Dr. Physick employs two angular splints.†

In fracture of the internal condyle, a roller is to be applied round the elbow-joint, and kept wet with an evaporating lotion; the limb is to be bent to a right angle, and kept in a sling; and ankylosis prevented by a timely recourse to passive motion of the joint.

The treatment of a fracture of the external condyle consists in applying a roller to the joint, and then an angular splint, capable of receiving the elbow, and adapted to the back of the arm and lower side of the forearm. The splint is to be firmly fixed with a roller. In about three weeks, the joint is to be gently bent and extended, in order to prevent ankylosis.‡

#### FRACTURES OF THE FOREARM.

The radius and ulna are most liable to be broken where they are most slender, and hence, when fractured together, the injury seldom happens at parallel points of them. The radius, in consequence of its connexion with the carpus, and its receiving every shock communicated to the hand, is much more frequently broken than the ulna. The fracture is often situated near the wrist, or about the middle of the bone, and rarely towards its upper end. When the radius breaks, it is mostly from a fall on the hand, but, when the ulna alone suffers, or both bones are fractured together, it is generally in consequence of violence applied directly to the forearm.

\* On Dislocations, p. 446.

† Gibson's Institutes, vol. i. p. 413.

‡ Sir A. Cooper, op. cit. p. 450.

In fractures of the forearm, the fragments are generally displaced, both with regard to the diameter and direction of the bone. The ends of the fracture are mostly inclined towards the centre of the limb. However, the upper portion of a broken ulna is not susceptible of this kind of displacement, on account of the manner in which it is articulated with the humerus. When both bones are broken, the limb is sometimes bent forwards, or backwards; but, though the fracture may be oblique, the ends seldom overlap each other; a kind of displacement, probably hindered by the interosseous ligament. In fractures of the thick portion either of the radius, or ulna, very little displacement is generally noticed.

Fractures of the radius are easily detected; for, on endeavouring to rotate the bone, or, in other words, to place the hand alternately in a prone and supine posture, a crepitus is immediately perceptible, and the upper fragment is motionless. When the two bones are broken, the nature of the accident is indicated both by the crepitus and the distortion of the forearm. Fractures of the ulna, especially when high up, are less obvious; but if the surgeon make pressure on each side of the suspected point, with his thumbs alternately, he will generally distinguish a grating sensation.

Fractures of the forearm, when unskilfully treated, are sometimes followed by one serious consequence, viz. the fragments unite in a position inclined towards the centre of the limb; the ends of the radius acquire a bony union to the ulna; no interosseous space is left; and the movements of pronation and supination are for ever lost.

As the fragments do not pass over each other, scarcely any extension is necessary for their reduction; but, the surgeon must gently press them away from the interosseous space.

The elbow is to be bent, and the hand put in the mid-state, between pronation and supination; that is to say, the palm of the hand is to face the patient's breast. After the reduction, a piece of soap-plaster is commonly applied, though it may be very well dispensed with, and over it a slack roller. Tight bandages have a bad effect, by pressing the radius and ulna together, without the possibility of answering any useful purpose. Sometimes two graduated compresses, three inches wide, as long as the hand and forearm, and half an inch thick at their bases, are put on the palmar and dorsal surface of the forearm and hand, with their bases downwards. They are secured with a roller, the application of which is to begin at the hand, and extend a little way above the elbow. They render the limb every where of uniform thickness, and press the muscles towards the space between the bones,\* so as to preserve it, and,

\* See Gibson's Institutes, vol. i. p. 418.

with it, the prone and supine motions of the hand. Only two splints are necessary; one is to be placed along the inside, the other along the outside of the forearm. If the above described graduated compresses be not used, soft pads must be interposed between the skin and the splints, in order to obviate the pressure of the hard materials, of which the latter are formed. The inner splint should extend nearly to the last joint of the fingers.

#### FRACTURE OF THE OLECRANON.

The olecranon is generally broken by falls or blows upon the elbow, and occasionally, though seldom, by the violent action of the triceps muscle; the injury may take place at various distances from the extremity of the process; the fracture may be single; or the part may be broken into several pieces. In consequence of the action of the triceps, and the effect of bending the elbow, the detached fragment of the olecranon would always be drawn up a considerable distance from the rest of the ulna, were it not that some ligamentous fibres, connecting the olecranon to the coronoid process, and also the upper part of the coronary ligament, sometimes continue entire.\* However, if the fracture be nearer the point of the elbow, the retraction will not be hindered by these ligamentous fibres. When the inflammation of the soft parts is very considerable, the use of a bandage and splint should be deferred three or four days, until the swelling has been diminished by leeches, venesection, cold applications, and other antiphlogistic remedies.

The treatment consists in relaxing the triceps and anconæus, by placing the arm in an extended position; pushing downward, and replacing the detached part of the olecranon; in confining it there with compresses and a circular bandage, applied immediately above the point of the broken process; and in maintaining the extended posture of the arm, by means of a pad and splint, bound on the front of the arm and forearm. Some practitioners object to keeping the limb completely extended, alleging that the cure is less perfect, the fragments more irregularly united, and the future movements of the joint less free, than when the elbow is kept slightly bent.

When the arm is too much extended, it is said that the detached portion of the olecranon is pushed from its notch in the lower head of the humerus, and does not correctly unite with the body of the ulna; but, if the forearm be not sufficiently extended, the olecranon may project too far after the cure, and come into contact with the humerus, before the limb is completely extended.† However, when it is recollected, that the

\* See Sir A. Cooper on Dislocations, p. 458, ed. 4.

† C. Bell's Operative Surgery, vol. ii. pp. 182, 183.



union is generally effected by a ligamentous substance, the preceding reasons have little weight; and the principle of rendering the interspace between the fragments as little as possible, seems commendable. It is the practice to which Sir Astley Cooper gives the preference. In a month, the splint is to be removed, and the joint gently moved every day.

#### FRACTURES OF THE METACARPAL BONES AND FINGERS.

In the treatment of fractures of the metacarpal bones, the essential object is to keep the adjacent joints perfectly motionless. For this purpose, the hand is to be placed upon a flat splint or hand-board, betwixt which and the palm, a suitable pad is to be put; a roller is to be applied, and the hand and forearm kept at rest in a sling. When the fingers are simply fractured, longitudinal pieces of thick pasteboard may be put along each side of the finger, and fastened with tape. The hand and forearm should be kept in a sling.

#### FRACTURES OF THE THIGH-BONE.

A fracture of the shaft of the thigh-bone, is attended with severe pain in the situation of the injury; sudden incapacity to move the limb; a crepitus, which is sometimes very distinct on moving the ends of the fracture; deformity in regard to length, breadth, and direction of the limb. Concerning the deformity, it is necessary to have very precise ideas; for, as it has a continual propensity to take place, especially in oblique fractures, its prevention is the chief object in the treatment.

In oblique fractures, the limb is constantly shorter than that of the opposite side, a circumstance plainly indicative of a displaced state of the ends of the fracture. The shortening of the limb arises from the end of the lower portion of the bone being drawn upwards, beyond that of the upper fragment; which itself can undergo no retraction. The muscles are the only powers which can cause this motion of the lower end of the fracture, from below upwards. On one side, attached to the pelvis, and, on the other, to the patella, tibia, and fibula, they make the former their fixed, and the latter their moveable point; and drawing upwards, inwards, and backwards, the leg, the knee, and the lower portion of the os femoris, they produce the displacement of the fracture: the principal agents being the triceps, semitendinosus, semimembranosus, rectus, gracilis, biceps, &c.

In Desault's works, a case is mentioned, that affords a striking illustration of the power of the muscles to displace the ends of the fracture. A man broke his thigh; but the ends of the bone continued duly together, though the fracture was oblique. This unusual circumstance was found to be owing to paralysis of the

limb; and no sooner was the latter affection cured, and did the muscles regain their power of contraction a few days afterwards, than the lower end of the fracture was drawn upwards, as in ordinary cases.

A fractured thigh is most liable to be followed by a permanent shortness of the limb, when treated on a bed which is too soft and yielding. As the buttocks form a greater projection than the other parts of the body, they soon cause a depression in the bedding, and hence a declivity of the surface on which the trunk lies, so that the body glides downwards, pushing in the same direction the upper end of the fracture, and making it pass beyond the lower one.

Transverse fractures of the thigh, which are said to be more common in children, than adults and elderly persons,\* are less liable than oblique cases to be attended with a shortening of the limb; because the surface of the upper end of the fracture makes mechanical resistance to the ascent of the lower portion of the broken bone.

The deformity of the limb, in regard to breadth, must necessarily accompany that in respect to length; but, it is quite obvious, that, in transverse fractures, the first sort of displacement may exist alone.

The deformity, in regard to direction, may result from the operation of the blow causing the fracture; from the awkwardness of those who carry the patient; or, from the bad position in which the limb is placed.

Besides the above kinds of deformity, the lower end of a fractured thigh-bone is mostly rotated outwards, an effect, which all the strong muscles have a tendency to produce, and which must always be increased by the weight of the leg and foot, when these are not adequately supported.

The higher the fracture is situated, the greater is the difficulty of keeping the fragments duly applied to each other. This is owing to the additional number of muscles, which acquire the power of drawing upwards the lower portion of the broken bone; and it must be plain to any surgeon, who devotes the least consideration to the subject, that such muscles as have their insertion above the breach of continuity, can have no effect in shortening the limb.

As the muscles of children are weaker than those of grown up patients, fractures of the thigh in them are generally attended with less displacement; a circumstance, perhaps, also in some measure explicable by the cases in young subjects being mostly transverse.

\* Delpech, *Précis des Maladies Chir.* t. i. p. 267.

## TREATMENT OF FRACTURED THIGHS.

Mr. Pott, seeing that the difficulty both in reducing displaced fractures of the thigh, and in maintaining the ends of the bone in a proper state of apposition, arose from the action of such muscles as draw upwards the lower portion of it, introduced into practice the method of placing the limb in a bent position, by which, he conceived, the most powerful muscles were relaxed. The same position he recommended, both at the time of reduction, and during the subsequent treatment. According to Mr. Pott, the position of the fractured os femoris should be on its outside, resting on the great trochanter; the patient's whole body should be inclined to the same side; the knee should be in a middle state, between perfect flexion and extension, or half bent; the leg and foot lying on their outside, also, should be well supported by smooth pillows, and should be rather higher in their level than the thigh. One very broad splint of deal, hollowed out and well covered with wool, rag, or tow, should be placed under the thigh, from above the trochanter to quite below the knee; and another, somewhat shorter, should extend from the groin to below the knee on the inside, or rather in this posture on the upper side; the bandage should be of the eighteen-tailed kind, and, when the bone has been set, and the thigh well placed on the pillow, it should not, without necessity, be ever moved from it again until the fracture is united.\*

Whoever peruses Mr. Pott's remarks on fractures with attention, will be led to think, that this eminent practitioner actually conceived, that the above position of the limb would relax every muscle connected with the broken bone; a thing which is certainly not effected. But, I believe, that when the direction, in which the lower end of the fracture is displaced, is taken into consideration, viz. upwards, behind the upper portion of the os femoris; and when the muscles, which have the greatest tendency to produce this effect, are calculated, it will be granted, that the majority of such muscles, *as have the greatest influence over the fracture*, are more relaxed in the bent, than they are in the straight position of the limb. However, Mr. Pott, by the term *relaxation*, might possibly mean only a state, in which the muscles are not actually stretched, though the origins and insertions of many of them might be brought much nearer together.

The bent position certainly does not completely incapacitate the muscles from displacing the fracture, and, of course, every possible assistance ought to be derived from the splints and the

\* Some few general Remarks on Fractures and Dislocations, in *Chirurgical Works*, vol. i.

rest of the apparatus. The bent position is also attended with the great disadvantage of leaving the leg in a moveable, unsupported state; a consideration, in my mind, strongly against the practice, inasmuch as every motion of the leg creates the most hurtful disturbance of the fracture. The bent posture may relax some of the most troublesome muscles; but, it cannot hinder all of them from disturbing the fracture, and it leaves the leg unfixed. The extended posture may not relax quite so many of the muscles, which tend to displace the fracture; yet, it affords an opportunity of applying splints to the whole limb, an object of the highest importance.

There is one part of the position, advised by Mr. Pott, for which I have never heard any reason assigned. I allude to his direction to place the leg and foot rather higher in their level than the thigh. Whoever has had opportunities of seeing many cases of broken thighs, must know, that when the ends of the fracture are united, the toes are frequently turned more outwards than is natural. Now, nothing has a greater tendency to produce this deformity, than twisting outward the lower portion of the broken bone, by elevating the leg and foot above the level of the thigh; a practice, which offers not a single advantage in return for this very serious effect of it.

Mr. Pott has mentioned only two splints: at present, whenever the bent position of the limb is chosen, a splint is usually laid along each of the four sides of the thigh. After duly placing the limb, the necessary extension is made. Then the under splint, having upon it a broad soft pad, and an eighteen-tailed bandage, is laid under the thigh, from the great trochanter to the outer condyle. Before applying the soap-plaster, and other splints, the surgeon must of course take care, that the fracture lie as evenly as possible.

The position, recommended by Mr. Pott for a broken thigh, is disapproved of by many surgeons; first, because it leaves the knee at liberty to move about; secondly, because it is difficult to make the patient lie for any length of time exactly on his side; and lastly, because though the relaxation of the most powerful muscles may be advantageous, the half-bent position does not in reality render these organs incapable of displacing the two portions of the broken bone, and, therefore, every aid which can be derived from mechanical means, should be employed, which is impossible in the foregoing posture of the limb.

When, as a modern surgeon has remarked, the limb is merely laid on the outside, gently bent, and secured with splints and bandages, the body and limbs of the patient lie well for some little time; the thigh rests upon its outside, and the body is inclined the same way: but, by and by, the patient turns



directly on his back, while the leg remains with the outside of the foot flat upon the bed.\*†

Mr. C. Bell recommends a modification of the bent posture, the peculiarity of his method consisting in the limb being placed upon cushions, which rest upon two boards, joined together at such an angle under the ham, that, when the patient lies upon his back, the hip and knee-joints will be in a moderately bent position. Near the edge of the inclined boards, there are holes made, and pegs of wood fitted to them. The limb is to be placed upon the cushions on the frame. The bone is to be set; and then one long splint is to be laid along the outside of the thigh from the hip to the knee; another upon the inside of the thigh; and over these, the eighteen-tailed bandage. If the board under the thigh be found too long, the hip is to be raised by placing a cushion under it; but, if the board be too short, the hip is to be allowed to sink as much as circumstances require, or the size of the pad under the knee is to be increased. In order to keep the foot from moving laterally, the edges of the cushions are folded up, and fixed by the pegs, by which means the sides of the whole limb may be supported from the knee to the ankle.‡

Twenty years ago, I saw used in St. Bartholomew's hospital, an apparatus calculated for maintaining the limb in the bent position upon the heel, calf, and under surface of the thigh, while the patient lies upon his back. It was a more complicated machine, however, than the preceding, and applicable either to Mr. Pott's, or the straight position, and either to cases of fractured thighs, or broken legs. It was an ingenious contrivance,

\* C. Bell's *Operative Surgery*, vol. ii. p. 191.

† {Mr. Abernethy, in his lectures, in remarking upon the position of the patient during the treatment of these fractures, says, "If the lower extremity be laid upon its side, and supported upon a splint, the fixity of the limb depends upon every longitudinal inch of the limb resting with its full weight upon the plane which supports it. Under these circumstances the limb may be lifted up upon a splint as upon a tray, and moved without the slightest alteration in the position of the fractured parts:—the application of an opposing splint gives it perfect steadiness." A person laid in this position for a certain time, makes a kind of cast in the bed in which he lies, and this subsequently supports him in the proper posture. "I have seen patients lie for three months in this position, without material inconvenience. I have known individuals who have twice had their thighs broken, and who, treated at one time by being laid on the back with the limb resting on the double inclined plane, and at the other by being placed on their side, have given a decided preference to the latter position, although it happened that the union of the fracture was much more tardy on this than on the former occasion.}

‡ A similar apparatus has been employed by Sir Astley Cooper for nearly twenty years past. The first invention of the kind was made by Mr. White of Manchester, iron being used instead of wood. See *Surgical Essays*, part ii. p. 49. 8vo. Lond. 1819.

exhibited by Mr. Abernethy in his lectures; and, what is worthy of notice, it afforded a better support for the foot, than the frames employed by Sir Astley Cooper and Mr. C. Bell.

The bent position of the limb, however, is now abandoned by many judicious surgeons; and the straight, or extended posture, adopted, which is certainly the most convenient for the application of an apparatus, calculated to afford support and steadiness to the whole member, and keep the knee and ankle-joints motionless. In this position, the chief reliance is upon two splints, one of which extends from the hip to the outside of the foot; the other from the space between the scrotum and the thigh down to the inside of the foot. The lower part of the external splint should be made to reach along the side of the foot, in order to afford support for a pad, which is to be placed there for hindering the foot from turning too far outwards.

Since no posture will hinder every muscle from having a tendency to displace a fractured thigh, several practitioners are yet inclined to believe, that the employment of permanent extension is a principle, which should not be relinquished.\* At all events, no doubt can exist about the propriety of endeavouring to make the apparatus more perfect and efficient.

In common fractures of the thigh, Delpech prefers the extended position; but, when the bone is broken directly below the trochanters, and the upper fragment is drawn considerably outwards and forwards by the psoas and iliacus internus, he conceives that the bent posture is the most advantageous. It is a case, in which the frames described by Sir A. Cooper and Mr. C. Bell would be useful.

Oblique fractures of the condyles, extending into the joint, the first of these surgeons recommends to be treated in the extended position, because the tibia presses the extremity of the broken condyle into a line with that which is not injured. The swelling and inflammation are to be at first actively treated with cold evaporating lotions, leeches, and other antiphlogistic remedies. A roller is afterwards to be applied, and the joint, and parts of the limb above and below it, enclosed in strong paste-board, put on wet, so that it may adapt itself to the shape of the limb. Lateral splints may also be employed, if preferred. In five weeks, Sir Astley Cooper advises gentle motion of the joint.†

#### FRACTURES OF THE UPPER PART OF THE THIGH-BONE,

Are divided into three kinds: first, that in which the fracture happens through the neck of the bone, entirely within the cap-

\* Delpech, *Précis des Maladies Chir.* t. i. p. 269.

† On Dislocations, p. 213, ed. 4.

sular ligament. Secondly, a fracture on the outside of the ligament, through the neck of the bone, at its junction with the trochanter major, the trochanter being split, and the neck of the bone received into its cancelli. Thirdly, a fracture through the trochanter major, beyond the point of union with the cervix. These distinctions, introduced by Sir Astley Cooper, are highly important, because they serve to reconcile the discordant statements respecting the possibility of effecting a bony union again; for while the first example appears from his experience not to admit of it, the two latter instances readily do so, like the generality of other fractures.\* The following are the symptoms of a fracture within the capsular ligament: the limb is from one to two inches shorter than the other, the trochanter being drawn up by the muscles as high as the ligament will permit. The limb may be easily lengthened by extension; but immediately it is left to itself, the retraction takes place again. In a very few instances the limb is not shortened; a fact, which is ascribable to the obliquity of the fracture, the upper portion of the bone hindering the ascent of the lower; or to other particularities in the shape of the solution of continuity, by which the fragments are entangled and locked to each other. Another symptom is the eversion of the foot and knee; an effect which all the strongest muscles, connected with the thigh-bone, tend to produce; and, although cases do present themselves, in which those parts turn inwards, they are extremely rare. In fact, they are not fractures within the capsular ligament, but examples, in which the fracture separates, along with the head of the bone, that part of the trochanter major, to which many of the muscles, possessing the power of rotating the limb outwards, are attached, and leaves connected with the shaft that part of the trochanter major, in which the glutæus medius is inserted. For this correct explanation, the profession is indebted to Mr. Guthrie,† who had an opportunity of dissecting such a case, and his statements are confirmed by the particulars of an examination of another similar case by Mr. Symes, of Edinburgh.‡ The patient, when perfectly at rest in the horizontal position, suffers but little, but any attempt at rotation is attended with pain, which is particularly felt at the upper and inner part of the thigh. Extension of the thigh may be performed; but its flexion is more difficult and painful.§ The next thing that deserves attention, is a remarkable diminution of the natural distance between the trochanter major and crista

\* On Dislocations, p. 103, ed. 4.

† Med. Chir. Trans. vol. 13.

‡ See Edinb. Med. Journ. No. 87.

§ Sir A. Cooper on Dislocations, &c. p. 106.

of the ilium. When the surgeon takes hold of the bone near the knee with one of his hands, and moves it, while he applies the other to the great trochanter, this process is found to be extremely movable, but less prominent than usual, and during the movements a crepitus is sometimes distinguishable. As a very little displacement, however, separates the fragments, a crepitus cannot always be perceived. According to Sir Astley Cooper, it is most readily detected by extending the limb, and rotating it inwards.

When the limb is shortened in a case of dislocation, the toes turn inwards, and are fixed in that position; but, in a fracture of the neck of the bone, the toes may be turned outwards or inwards by the surgeon, without much opposition.

Women are much more liable to this species of fracture than men; which is referred by Sir Astley Cooper to the more horizontal direction of the neck of the bone in females. One circumstance that promotes the frequency of the accident, is the natural spongy structure and thinness of the shell of the bones of old persons, in whom the case is chiefly met with. It is calculated, indeed, that out of every ten fractures of this description, nine take place in subjects above the age of sixty. Sir Astley Cooper, in an extensive practice, during thirty years, in the course of which he has seen at least two hundred and twenty-five of these cases, has known of only two within the capsular ligament happen in patients under fifty.\* In women, the neck of the thigh-bone stands out nearly at a right angle, while, in men, it has a sloping direction: hence, it is more apt in the latter to be broken by a fall on the side, or a force operating upon the great trochanter.

When force is directed against the os femoris, from before or behind the limb, a fracture of the neck of the bone is more likely to happen than a dislocation, on account of the great depth of the acetabulum, and the firm manner in which the head of the bone is secured in the socket. A fall upon the great trochanter; a similar fall upon the knee; or alighting with force upon the feet; a powerful twist of the thigh-bone, may all produce a fracture of its neck. Hagedorn, the author of a valuable treatise† on fractures of the neck of the thigh-bone, considers a fall upon the great trochanter as the most frequent cause of the accident, which is true with respect to men. In London, Sir Astley Cooper regards a sudden slip of the foot off the curb-stone, as the most common cause of the injury.

In all the examinations, which Sir Astley Cooper has made

\* On Dislocations, p. 111, ed. 4.

† Abhandlung über den Bruch des Schenkelbeinhalses, nebst einer neuen Methode denselben leicht und sicher zu heilen. Leipzig, 1808.



of transverse fractures of the neck of the thigh-bone, *entirely within the capsular ligament*, he has never met with an instance, in which a bony union had taken place, or where there was not motion of one end of the bone on the other. He does not deny, however, that, under particular circumstances, such a union may be possible, when the bone is broken, without the periosteum being torn, and when the fracture is oblique, partly within, and partly on the outside of the capsular ligament. He refers the hinderance of a bony union in cases of transverse fracture, strictly within the capsular ligament, to laceration of the ligamentous sheath and periosteum of the neck of the bone, and to a consequent deficiency of the circulation in the head of the bone. If a fracture were to happen, without the reflected ligament being torn, he conceives, that the bones might unite; but, the symptoms would be different; the nature of the injury would scarcely be discerned; and the cure require little surgical attention.\* In other cases, of the nature already specified, ossific union is not produced; slight attempts at it are made upon the neck of the bone, and upon the trochanter major, but scarcely any upon the head of the bone; and, when union takes place, it is by means of ligament.†

The fibrous expansion, which invests the neck of the femur, serves the office of the periosteum, and is the principal means through which the smaller fragment is supplied with blood. When it is torn, the latter portion of the bone is scarcely capable of contributing at all to the process of union, and the surface of the other fragment at length throws out irregular masses of a soft fleshy substance, in the midst of which the inner fragment remains, more or less movable, without any other kind of connexion to the rest of the bone.

Sometimes, a fibrous ligamentous substance becomes the uniting medium, the subsequent lameness is great, and the limb shortened.

Lastly, in old subjects, the friction of the pieces of bone against each other, frequently causes them to be worn away, or absorbed, the neck of the bone entirely disappearing. Indeed, it would appear from Sir Astley Cooper's observations, that, in aged persons, the neck of the thigh-bone sometimes naturally undergoes an interstitial absorption, by which it becomes shortened, altered in its angle with the shaft of the bone, and so changed in its form, as, upon a superficial view, to give an idea of its having been formerly broken.‡

The treatment, recommended by Sir Astley Cooper, consists in placing a pillow under the limb, its whole length; putting

\* On Dislocations, &c. p. 114, ed. 4.

† Op. cit. p. 124.

‡ A. Cooper, Surgical Essays, part ii. p. 26.

another under the knee; and keeping the limb in this extended position ten days or a fortnight, until the inflammation and pain have subsided. The patient is then to rise and sit in a high chair, in order to prevent a degree of flexion which would be painful. He is next to walk with crutches, bearing gently on the foot at first, and, by degrees, more boldly. Lastly, a high-heeled shoe is to be worn, and the crutch exchanged for a stick. Sir Astley admits, however, that, in every case in which a doubt exists whether the fracture may not be partly or wholly on the outside of the capsular ligament, the same treatment should be followed, as if it were certainly an example, in which an osseous union could be produced.

In an impartial consideration of this subject, two facts, admitted by all parties, seem to me to deserve particular attention; the first is, that an union by means of a ligamentous substance frequently takes place; the second is, that the surgeon generally cannot know whether the fracture is entirely within the capsular ligament, or not. Both these reflections would incline me to give the patient the best chances of union, with as little deformity as possible, by maintaining the limb steadily in the most eligible posture. This will be presently explained, when I describe Hagedorn's apparatus.

*Fractures of the neck of the thigh-bone on the outside of the capsular ligament, and extending into the cancelli of the trochanter major, admit of bony union.* According to Sir Astley Cooper, the limb is shortened about a half, or three-quarters of an inch; the toes are turned out; great pain is felt at the hip, and on the inner and upper part of the thigh; and the roundness of the joint is lost. The circumstances, however, particularly denoting the nature of the accident, are, first, its general occurrence in young persons, and adults *under fifty years of age*, though it does also sometimes happen beyond that age. Secondly, whilst the fracture within the capsular ligament is mostly produced by very slight causes, this is caused either by severe blows, or falls upon the edge of some projecting body, or by the passage of heavy carriages over the pelvis. Thirdly, the crepitus is readily perceptible, without drawing down the limb. Fourthly, a great deal of ecchymosis is frequently present. Fifthly, the upper part of the thigh quickly becomes swelled and painful. Sixthly, the case is generally productive of much more suffering, than a fracture within the capsular ligament.\*

In fractures of the neck of the thigh-bone, the half-bent position of the limb, with the patient resting upon his side, ought for several reasons to be abandoned. When this mode of treat-

\* Sir A. Cooper on Dislocations, &c. p. 145, edit. 4.

ment is adopted, the posture soon alters, no efficient apparatus can be employed, the length of the injured limb cannot be compared with that of the injured one, and severe pain and other bad effects are the result of the continual pressure on the great trochanter.

With respect to the modification of the bent position, by letting the under part of the thigh, the calf, and the heel, rest upon two boards, which gradually rise from the surface of the bed to an angle in the ham, while the patient lies upon his back, I think it a much better plan, than that recommended by Mr. Pott. At the same time, I consider it imperfect, because it does not make adequate extension, nor afford proper support and steadiness to the foot.

The principal parts of Boyer's apparatus are, a splint of particular construction, a foot-support, and a kind of padded belt, which is buckled round the upper part of the thigh.

The splint should be four feet long, and three finger-breadths wide. A groove, half an inch broad, and the extremity of which is covered with iron, runs along about half the length of the splint. To this groove a screw is adapted, which occupies its whole length, one end of it being supported against the plate of iron covering the extremity of the groove, and the other made to fit a key, by means of which it is to be turned. On the inside of the splint, a contrivance for holding up the foot-support is fastened to this screw. The upper part of the splint is received in a pocket situated on the external side of the circular thigh-belt. The sole, or foot-support, is made of iron, and covered with soft leather. It is connected by means of a mechanical contrivance to the above-mentioned screw. To that part of it which is near the heel, a broad piece of soft leather is attached, which, being split into two straps, serves for fixing the sole to the foot.

The thigh-belt is composed of strong leather, covered with the same material, of a softer quality, and well stuffed with wool. Near the place where its two ends are buckled together on the limb, the little leather pocket is sewed, for the reception of the upper end of the long external splint.

The apparatus is applied as follows: after having surrounded the upper part of the thigh with a soft cotton band, the padded leather thigh-belt is put over it. The foot and lower part of the leg are then to be protected with tow, soft cushions, or any other soft materials, from the effects of pressure, and the sole is to be applied to the foot. The upper end of the splint is now to be fixed in the pocket of the thigh-belt, and the sole is fastened at the proper place to the screw part of this long external splint. Pads, tow, or other soft materials, are next to be employed, wherever needed for preventing the ill-effects of the

pressure of the foregoing apparatus, and also of two other splints, which will be required. One of these is laid all along the front or upper surface of the limb, the other is applied to the inner side of it; and both are secured in the ordinary manner.

Things being thus arranged, the screw in the groove is turned by the key, and the sole descends and brings the foot with it, while the superior part of the splint is pushed upwards. Thus, the limb may be gradually extended, and the extension, if necessary, increased.\*

Perhaps, the best apparatus ever invented for fractures of the neck of the thigh-bone, is that suggested by Hagedorn. His opinion is, that every apparatus for these cases should be calculated to fulfil the following indications. 1st. It should keep the leg duly extended, and at the same time prevent the foot from being turned outwards. 2. As all pressure on the muscles of the thigh has a tendency to make them contract, the extension is more effectual when applied, not to the thigh, but to the lower part of the limb. 3. The apparatus must be made as little irksome to the patient as possible. 4. The patient should not have it in his power to interfere with the extension and reduction. 5. The apparatus should admit of the employment of fomentations or other applications.

A reference to plate xiii. figs. 2, 3, and 4, will convey an adequate idea of Hagedorn's ingenious apparatus, the principle of which is simple, and effectual in fulfilling the requisite indications.

See plate xiii. fig. 2. A view of the outside of Hagedorn's splint, which for an adult is between three and four feet long, about five inches broad at its upper end, and becomes gradually narrower down to its lower extremity, where it is not

\* See *Traité des Maladies Chirurgicales et des Opérations qui leur conviennent* par M. le Baron Boyer, t. iii. p. 299, &c. 8vo. Paris, 1814.

The nature of Boyer's ingenious apparatus will be better understood by reference to plate XIII. fig. 1.

*a. a. a.* The limb extended.

*b. b. b.* The splint for making continued extension.

*c. c.* The screw for lengthening the splint.

*d.* The key, or handle for turning the screw.

*e. e.* The moveable worm, or female-screw, through which the long screw passes. It is furnished with plates, and calculated to slide upon the splint.

*f.* The upper end of the splint received in the little pocket on the outside of the thigh-belt.

*g.* The thigh-belt, applied.

*h. h. h. h.* The upper, or front splint, applied.

*i. i. i. i. i.* Pads filled with wheat-chaff, or other soft materials.

*k. k. k. k. k.* Tapes with which the whole apparatus is fastened.

*l.* The iron sole.

*m. m.* The supports of the iron sole.



Fig 1

Fig 3

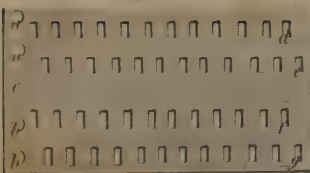
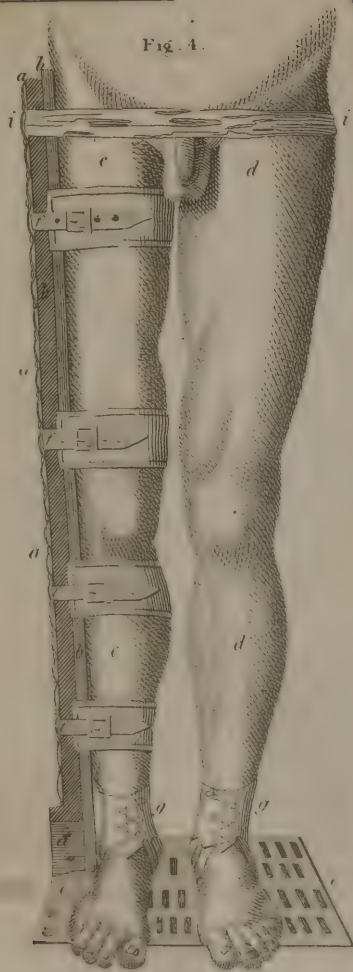


Fig. 2



Fig. 4





much more than two inches wide. On its inside it is excavated from its highest part down to a little below the calf, where the concavity ceases, by which means the inferior part of it is stronger, and more fit for bearing the screws, foot-board, &c.

*a. a. a. a.* The slack leather, with the nails attaching it to the outside of the splint.

*c. c.* The middle of the splint, from which point it becomes smaller and smaller down to its lower termination, *d.*

*d.* The lower end, to which the foot-board *e. e.* is firmly fixed.

Fig. 3. The foot-board.

*a. a.* Two holes, through which the foot-board is screwed to the splint when the case is a fracture of the neck of the left thigh-bone.

*b. b.* Two similar holes, when the fracture is on the right side.

*c. c.* The edge of the foot-board made thicker, the breadth an inch, or an inch and a half, and strengthened with a plate of iron, in order to make it capable of firmly holding the screws, which fasten it to the lower end of the splint.

*d. e. f. g.* Four rows of slits, or holes, through which the ends of the bandage pass, which fasten the foot to the foot-board.

Fig. 4. Represents the whole apparatus, as employed in the treatment of a fracture of the neck of the left thigh-bone.

*a. a. a. a.* The splint applied to the uninjured limb.

*b. b. b.* A long pad placed between the splint and the outside of the limb.

*c. c.* The sound limb.

*d. d.* The left limb, in which the neck of the thigh-bone is fractured.

*e. e.* The foot-board.

*f. f. f. f.* Four leather bands, with straps and buckles for securing the splint and long pad upon the sound limb.

*g. g.* The leather contrivances, somewhat like gaiters, designed to connect the feet securely with the foot-board. Each of these leather bandages has four straps, two of which are conveyed on each side of the foot through two of the holes in the foot-board, and fastened underneath it. The leather, of which these pieces of the apparatus are made, should be rather stiff, and well quilted within, or lined with very soft materials. In front, each of these foot or ankle-pieces admits of being laced, so as accurately to fit the part.

*h.* The broad linen band, which keeps the foot inclined inwards. Between this band and the instep, some soft materials, or a pad, should be placed. It has four tails, two of which on

each side pass through the anterior rows of holes in the foot-board, and are tied underneath it.

*i. i.* A soft linen band, the use of which is to fasten the splint to the pelvis.

*k.* An empty space, which is sometimes filled up with a small pad.

Between the soles of the feet and the upper surface of the foot-board, soft pads are placed, which being of the same shape and size of the soles of the feet, do not appear in this engraving.

Previously to the reduction, the splint is to be fastened upon the sound limb, and the two ankle-leathers applied. After the reduction, two assistants are to keep the limb extended, while the surgeon screws on the foot-board, and places under the sole of the sound limb the pad, or little cushion, which becomes secured in this situation as soon as the four tails of the ankle-leather have been drawn through the first and second rows of slits in the foot-board, and tied underneath it in a couple of surgeon's knots. The sound limb is now to be approximated to the broken one; both are to be put in the most natural situation and position; the other cushion is to be interposed betwixt the foot-board, and the sole of the fractured limb; the four tails of the ankle-leather on the injured member are to be drawn through the first and second rows of slits in the foot-board, and tied; the foot-board itself is now to be screwed to the splint as firmly as possible, and a little wedge, not mentioned in the previous account, pushed into the space between the two screws and the foot-board. Lastly, in order to prevent the toes from being turned outwards, the band is applied across the upper part of the foot, and its tails fastened under the foot-board.

Dr. Gibson, professor of surgery in the University of Pennsylvania, having found, upon trial, that Hagedorn's apparatus did not prevent an inclination of the pelvis towards the affected side, makes use of two splints, which extend from the arm-pits, where they are padded like the head of a crutch, along the sides of the body, thighs, and legs, and beyond the feet. Their inner surface is lined with soft materials, and they are fastened with six or eight broad tapes, or bands, applied round the limbs, pelvis, and chest. In other respects, the apparatus resembles that proposed by Hagedorn.\*

*Fractures extending obliquely through the trochanter major*, have frequently been confounded with those of the neck of the bone. They occur at every period of life. According to Sir Astley Cooper, the leg is little, or not at all shortened; the foot is benumbed; the broken portion of the trochanter, is some-

\* Gibson's Institutes, vol. i. p. 445.



times drawn towards the ilium; sometimes towards the tuberosity of the ischium; but it is generally widely separated from that portion which remains connected with the neck of the bone. The foot is much turned out, and, if the trochanter be much displaced, a crepitus not readily felt. The upper part of the trochanter is fixed, while the rest of it follows the motions of the thigh-bone. The treatment consists in maintaining the external portion of the trochanter in a due position, with respect to the internal fragment, by means of a pad and bandage round the pelvis, the limb being kept in the horizontal posture, and perfectly quiet, with the feet attached to a foot-board. An apparatus, constructed on the principles of that suggested by Hagedorn, might here be advantageous.

#### FRACTURES OF THE PATELLA

Are generally transverse; seldom oblique; and still more rarely longitudinal, or perpendicular. The bone, however, is sometimes broken into three or four pieces.

A longitudinal fracture, and that in which the patella is split into several pieces, are invariably produced by a fall, or a blow, and are attended with a good deal of contusion, and sometimes with a wound. A transverse fracture may also be produced in the same way; but its usual cause is a violent contraction of the extensor muscles of the leg, when the body is inclined backwards, and the patient is in danger of falling upon his occiput. In this dilemma, the knee being bent, the extensor muscles of the leg act with considerable force to assist in bringing the body forwards again; while the patella, the posterior surface of which at this moment only rests upon a point of the forepart of the condyles of the femur, is placed between the resistance of the ligament connecting it to the tibia, and the action of the extensor muscles. Under these circumstances, if the action be superior to the resistance, the bone snaps; an event now more likely to happen, because in consequence of the flexion of the knee, the direction of the extensor muscles and that of the ligament of the patella, are rendered oblique with respect to the vertical axis of this bone. Hence, these two powers, one of which acts upon the upper, and the other upon the lower, portion of the patella, have the effect of tending to bend it backwards exactly at that point which rests upon the condyles of the thigh-bone.\*

Though such is the principle on which the generality of transverse fractures of the patella are produced, a few cases upon

\* Boyer, *Traité des Maladies Chirurgicales*, tom. iii. pp. 322, 323. 8vo. Paris, 1814.

record establish the possibility of the bone being also broken by the violent action of the muscles, while the leg is perfectly straight, and, of course, the force applied precisely in the axis of the bone. Thus, the fracture has been known to take place during an attack of convulsions, while the patient was stretched upon his back.

Whether the ligamentous expansion covering the anterior surface of the patella be lacerated or not, is a circumstance which makes an important difference in simple fractures of this bone. In general, when the knee has not been considerably bent in the fall, or by improper examinations of the limb, the above ligamentous layer is left partly, or entirely, unlacerated; and the fragments of the bone are then only moderately separated from one another. But, when the knee has been violently and repeatedly bent, the ligamentous covering of the front of the patella is more or less torn, and the pieces of bone drawn further asunder.

The history of surgery does not furnish numerous instances of the longitudinal fracture of the patella: one such case, however, is related by Lamotte.

There is no difficulty in ascertaining the existence of a transverse fracture of the patella. When the patient is standing up at the period when the force of the muscles breaks the bone, the subsequent fall is a consequence of the accident. In this case, as well as in the example in which the bone is broken by the fall itself, the patient cannot get up without succour; and if, when he is put upon his legs, he endeavour to walk a few paces forwards, he falls down again. But if he be assisted with an arm, and keep his limb straight, he may hobble along a good way, and meet with no other fall, especially if the ground be not too irregular. The transverse division of the bone, and the interspace between the two fragments, can be plainly distinguished under the integuments. Instead of the prominence of the patella in front of the knee, a flatness or even a depression may be remarked. When the leg is extended and the thigh bent, the two pieces of bone are brought near together again, and a very little pressure will then suffice for putting them in contact with each other. When this has been done, if they be moved laterally in opposite directions, they will rub against each other, and a crepitus be felt. However, it is only when the soft parts are not considerably swelled, that the solution of continuity in the bone, and the separation of the fragments, are manifest.

Fractures of the patella are rarely united by bone, the connecting medium being in almost all cases a fibrous ligamentous substance. The possibility of a bony union, however, is uni-

versally admitted; and Lallemand\* had a preparation which exemplified the fact.

But, though experience may hold out little hope of these fractures being accurately united by bone, the same source of knowledge leaves no doubt of one important fact relating to this point, viz. that when the union is effected by means of a ligamentous substance, the perfect action of the extensor muscles, and, of course, the exemption from future infirmity of the knee, will mainly depend upon the shortness of the connecting medium, and the little distance between the two fragments.

In the treatment of a transverse fracture of the patella, the indications are:

1st. To place the limb in a position, that will relax the extensor muscles of the leg as much as possible.

2dly. To maintain the limb in this position, by means which will counteract the efforts of the flexor muscles.

3dly. To keep the fragments pressed towards each other.

The requisite apparatus consists of a hollow splint, long enough to reach nearly all along the back part of the thigh and leg, and lined with a suitable pad: a small compress; a common roller; and three or four pillows.

The first thing is to put the patient in such a posture as will relax the extensor muscles of the leg, and allow the pieces of the patella to be placed near together. With this view, the patient is to lie with his trunk and head somewhat elevated, by which means the anterior inferior spinous process of the ilium, from which the rectus muscle arises, will be inclined forwards towards the thigh. Then an assistant is to take hold of the foot, and raise the limb from the bed, being very careful to keep the knee from bending; and when the thigh and leg have been thus elevated to such an angle, as will perfectly relax the muscles attached to the patella, the surgeon is to form with the pillows above mentioned a surface for the support of the limb, gradually rising from the buttock to the heel.

The long splint and its cushion are now to be laid under the thigh and leg, secured with the roller, and kept up at a proper angle with the pillows. At first, an evaporating lotion should be applied to the knee itself, and no pressure made on it, till the swelling and inflammation have been reduced by antiphlogistic remedies. Then the fragments of bone having been pressed towards each other, are to be kept so with a compress placed just above the upper one, and bound there with a few turns of the roller; the bandage being applied to the joint in

\* Richerand, *Nosographie Chir.* t. ii. p. 387, ed. 4. The case is detailed by Boyer, in his *Traité des Maladies Chir.* t. iii. p. 355. See other cases referred to by Sir A. Cooper; *On Dislocations, &c.* p. 201, ed. 4.

the form of the figure 8, so that the turns go to the ham, and also above and below the patella.

For keeping the pieces of bone near each other, Sir Astley Cooper employs a leather strap, which is buckled round the thigh, above the upper fragment. Another strap is then applied to the middle of the foot, and its two ends, being carried up the sides of the limb, are buckled to the strap round the lower part of the thigh. The longitudinal strap may be fixed to the foot and leg with tapes.

Many surgical writers recommend the knee to be moved a little every day, at an early period of the treatment, in order to prevent the joint from becoming stiff. But, premature flexion of the knee will have the effect of elongating the uniting substance of the two fragments of bone, and increasing the distance between them; the sure consequence of which will be a permanent weakness of the knee, much more serious than the curable rigidity proceeding from confinement of the joint. For this reason, Boyer generally enjoins his patients not to begin to bend their knees earlier than two months after the accident. Sir Astley Cooper has recourse to passive motion of the joint in five weeks, unless the patient be old, in which case he keeps the limb perfectly at rest for a week longer.\*

When the case has been badly treated, or neglected, and the upper piece of the broken patella continues permanently retracted far up the thigh, with a long ligamentous substance forming the connexion between the two fragments, experience proves, that the extensor muscles of the leg may gradually regain a good deal of the power which they have lost under these circumstances. As an illustration of this fact, Mr. Abernethy mentions in his lectures the advice given by Mr. Hunter to a patient in this condition; it was, that he should sit upon a table, and frequently try to put the extensor muscles of the leg in action, while the limb was swinging backwards and forwards. By persevering in this way for some time, the patient at length found, that he had some power of extending the leg. A weight was now put on the foot, and increased in proportion as the muscles recovered their power.

#### FRACTURES OF THE LEG.

When the two bones are broken, the solutions of continuity are sometimes parallel; sometimes at different heights. The direction of the fracture of each bone is also subject to variety; in some cases being transverse, which is most common in children; in other instances, oblique; and, what is remarkable, the obliquity of fractures of the tibia has something determinate

\* On Dislocations, p. 204, ed. 4.



about it, usually extending from below upwards, and from within outwards, so that the end of the upper fragment is generally manifest below the integuments at the front and internal part of the leg. Lastly, either of the bones may be broken in several places, and the soft parts more or less contused, or lacerated, either by the ends of the broken bone, or the same force which occasioned the fracture itself.\*

Cases, in which the two bones are broken, are frequently the consequence of falls upon the feet, the fracture being mostly oblique, and that of the tibia situated a little below its middle portion. However, when the tibia gives way at this point, the fibula often breaks towards one of its extremities. As the tibia alone sustains the weight of the body, it is evident, that when both bones are broken by a force, which acts perpendicularly, the tibia gives way first, its fragments are displaced, and the force continuing to operate, then bends the fibula, the fracture of which is subsequent to that of the other bone. Both bones of the leg may also be fractured by direct violence, as when the wheel of a carriage passes over the limb, or a heavy body falls upon it.

The displacement of the fragments depends upon the direction of the division of the bones, and the nature of the cause of the injury. When the fracture is transverse, the displacement can only take place in the diameter of the fragments, particularly when the injury is situated high up, where the surfaces of the broken part of the tibia are large. In fractures of both bones of the leg, however, the ends of the bones seldom remain long in their natural situation, even when their surfaces are broad, and the solution of continuity is transverse, because every movement of the limb has a tendency to produce displacement. When the fracture is oblique, and has been produced by a fall on the foot, the ends of the fracture must inevitably pass beyond each other. In the majority of instances, the end of the upper piece of bone presents under the integuments of the skin a sharpish point, directed downwards and inwards; while the extremity of the lower portion is drawn backwards and outwards by the muscles of the calf.

The lower portions of the broken bones are liable to a rotatory displacement; the tendency to which is increased by the foot being naturally turned outwards, and the greater portion of its mass and weight being external to the axis of the limb.

Fractures of both bones of the leg are readily ascertained; for the slightest deformity is obvious along the sharp ridge termed the spine of the tibia, as well as upon its anterior flat

\* Boyer, *Traité des Maladies Chir.* t. iii. p. 361.

surface, usually called the shin. The gentlest movement of the limb will produce a very plain crepitus.

To the directions given in the Dictionary, for the reduction and treatment of ordinary fractures of the tibia and fibula, I have nothing particular to add in the present place; but, there is one case, which I am called upon to notice, because, on its treatment, Pott and Dupuytren offer different sentiments. Having given in the article *Dislocation*, of the foregoing publication, the opinions of the first of these eminent surgeons on the utility of the bent position, and of the relaxation of the strong muscles of the leg, in the management of fractures of the fibula, accompanied with luxation of the ankle, I shall not here recapitulate his arguments; but confine myself to a plain statement of Dupuytren's observations, the value of which can only be determined by fair and comparative trials of the two modes of practice recommended.

The plan of treating fractures of the fibula, with luxation of the foot, in general use in England, is that of Pott; but, notwithstanding the greatest care and attention, it is alleged, that some degree of distortion of the foot, or confinement of its movements from a little displacement of the fractured portions of the fibula, has been a frequent consequence of this accident so managed. It is said, that Pott's method of treatment is not calculated to prevent the falling-in of the lower extremity of the fibula towards the tibia. In a fracture of the lower end of the fibula, when the foot is brought into the state of extreme adduction, it draws by means of the lateral ligaments the point of the outer malleolus in an inward direction, and, consequently, the fractured portion corresponding to it is drawn outwards from the tibia. It is on this principle, that Dupuytren's mode of treating this accident is founded. In all cases, then, a fracture of the fibula, accompanied with luxation of the astragalus inwards, (that is, with distortion of the foot outwards,) requires an apparatus, which maintains the foot turned inwards, and the inferior fragment of the fibula raised from the tibia, and in the direction of the superior fragment. The simple apparatus recommended by Dupuytren, is as follows: a cushion, a splint, and two bandages, are the whole of it. The cushion, made of linen, and stuffed two-thirds full of hair-balls, or chaff enclosed in bags in the usual manner, should be two feet and a half in length, four or five inches in breadth, and three or four inches in thickness. The splint is to be from twenty to twenty-three inches in length, and three inches broad. Lastly, the two rollers should each be from four to five yards in length. The cushion, doubled in the form of a wedge, should be applied on the internal side of the fractured limb, its base below, and rest-

ing on the internal malleolus, without passing beyond it; its summit above on the internal condyle of the tibia. The limb is thus protected from the splint, which derives from the pad a support, that keeps it at the distance of several inches from the internal margin of the foot, and at the same time tends to throw the tibia outward. The splint, applied along the cushion, should extend six or seven inches below it, which will be about four inches below the internal margin of the foot. These parts of the apparatus being thus disposed, should then be fixed by one of the bandages passed round the limb below the knee, when the portion of the splint extending below the cushion will leave between itself and the foot an interval of several inches, and furnish a *point d'appui* to which the foot may be drawn from without inwards. In order to effect this purpose, the second bandage should be drawn from this point over the instep and heel, alternately embracing the splint and the parts of the limb just indicated, in circles gradually lessening, and forming the figure of the cypher 8, with the crossing part on the splint. Thus, the apparatus acts on the principle of a lever of the *first kind*, in which the *point d'appui* is the base of the cushion, a little above the malleolus internus, and in which the resistance, as well as the power acting on the fracture, are in the extremities of the foot. The foot thus drawn, must yield to the action of the lower bandage, while the tibia, pressed by the base of the cushion, must be propelled outwards with the astragalus. Lastly, it is evident, that, as the lower fragment of the fibula is drawn downwards by the external lateral ligaments of the ankle, a tilting movement must be produced on the external surface of the astragalus, contrary to that which displaced it. With a view of obtaining a complete reduction, Dupuytren says, that the surgeon must not confine himself to drawing the foot in a perpendicular line under the limb; it must be brought as much inwards, as it had been turned outwards by the peroneal muscles.

After the foot has been retained a good while in this forced state of adduction, if it should not return to its ordinary position, the defect may be easily remedied by applying the preceding apparatus to the outer surface of the leg and foot.

When, with a fracture of the fibula, the foot is drawn backwards and upwards, Dupuytren applies the splint and cushion to the back part of the leg down to the heel. One roller is applied below the knee; and a second round the lower end of the tibia and splint. A square pad should always be put between the lower bandage and the tibia. Of two hundred and seven cases of fracture of the fibula, comprising all the varieties of this accident treated in the above way, by Dupuytren, two hundred and two were cured; the remaining five died, three of

them from the consequences of the injury itself, or from complications independent of it.

Seven-tenths of them happened to the right leg; six-tenths arose from violent adductive motions of the foot; three-tenths from similar adductive movements; and one-tenth from blows, or the passage of some heavy body over the external and inferior part of the limb. With respect to the seat of the fracture of the fibula; in five-tenths it was two inches from the lowermost point of the external malleolus; in three-tenths, below this point; and in two, above it. Cases, within two inches of the external malleolus, were often complicated with displacement of the foot; the others but rarely.\*

Sir Astley Cooper's treatment of a fracture of the fibula, near the ankle, consists in applying a many-tailed bandage, which is kept wet with a lotion of spirit of wine and water; putting on each side of the limb a splint with a foot-piece, furnished with cushions, by means of which the great toe is maintained in a line with the patella. The limb is laid on its side, in the half-bent posture.

In fractures of the tibia at the ankle, his splints are also provided with foot-pieces, padded so as to incline the foot inwards, and keep the great toe in a line with the patella.†

## CHAPTER LXIV.

### PARTICULAR DISLOCATIONS.

#### DISLOCATION OF THE LOWER JAW.

IN children, the rami of this bone form, with its body, or rather the plane of its base, a very open angle, these parts being in reality almost in the same line. By reason of this conformation, the condyles are articulated with the base of the cranium at a very acute angle, the sinus of which is turned forwards. Hence, an obtuse angle with the base of the skull, could never be produced, unless the lower jaw were depressed in a degree which never happens, and which neither the length of the elevator muscles, the natural mode of opening the mouth,

\* See *Mémoire sur la Fracture de l'Extrémité inférieure du péroné, les luxations, et les accidens qui en sont la suite*, par M. Dupuytren, in *Annuaire Medico-Chirurgical des Hôpitaux de Paris*. 4to. Paris, 1819.

† On Dislocations, &c. pp. 331, 332, ed. 4.



nor even the situation of the vertebral column, will permit. Hence, children are not subject to dislocations of the jaw, notwithstanding they are commonly putting large substances into their mouths, and doing those things which are well known to promote, at other periods of life, the occurrence of the accident.\*

The lower jaw is subject to only one species of dislocation, namely, that in which the condyles advance forwards over the eminentiæ articulares, and slip under the zygoma. Sometimes the luxation is confined to one side; but, more commonly, both condyles are displaced. A case is noticed by Sir A. Cooper, under the name of *subluxation*, in which the condyle merely slips out of the interarticular cartilage, and the jaw becomes motionless, with the mouth slightly open. The case generally rectifies itself; but he has known it continue some time.† The two first cases, which are the only ones requiring particular notice, ought unquestionably to have appropriate names—names, which will not convey any erroneous notion: therefore, instead of calling the displacement of both condyles a *complete dislocation of the jaw*, and that of one condyle, an *incomplete dislocation*, terms which may lead to the supposition, that there are cases, in which the condyles do not entirely quit the articular surface of the temporal bone, I should think with Boyer, that it is best to denominate the displacement of both condyles simply a *dislocation of the jaw*, and the other instances, *dislocations of the right, or left condyle*.

When the lower jaw is dislocated by the action of the muscles, as in gaping, vomiting, laughing, &c. the muscles inserted into the os hyoides first depress the bone, and, in proportion as this movement increases, the pterygoideus externus acts, and draws the condyle and interarticular cartilage forwards upon the eminentia articularis. When the mouth is wide open, a very moderate blow, or force, applied to the chin, in the direction downwards, will cause a dislocation of the condyles. The violence, used in the extraction of a tooth, will sometimes produce it.‡

When the lower jaw is dislocated, the mouth is at first widely open, and the space between the two arches of the teeth considerable; but, a short time afterwards, this distance is lessened, the two jaws come nearer together, and the edges of the incisores teeth remain about an inch and a half asunder. This change, which sometimes takes place immediately after the luxation, is to be ascribed to the action of the temporal muscle, which has the more effect because its insertion into the coro-

\* Boyer, *Traité des Maladies Chir.* tom. iv. pp. 77, 78.

† On Dislocations, &c. p. 363.

‡ See Loder, *Chirurgisch-Med. Beobachtungen*, p. 181. 8vo. Weimar, 1794. A. Cooper on Dislocations, p. 360, ed. 4.

noid process is now nearly at a right angle. This movement, however, cannot be carried so far as to bring the teeth together, because the coronoid process actually touches the cheek-bone. The upper and lower teeth no longer correspond: the lower incisores being too much forwards; and if the mouth were completely shut, these would project beyond the teeth above them. Each of the lower grinders also advances beyond its fellow in the upper jaw. The space between the molares of the two jaws is not very great, and, in many cases, the thumb can scarcely be got between those situated furthest back. The irritation and compression of the parotid glands produce an increased secretion of the saliva, which is involuntarily discharged from the mouth. The articulation of words is difficult, and the pronunciation of syllables with the labial consonants impossible. Instead of the prominence formed by the external side of the condyle, immediately in front of the meatus auditorius externus, behind the root of the zygoma, a depression may be remarked, caused by the outer portion of the glenoid cavity of the temporal bone. The elongation of the muscles occasions a flatness of the cheeks and temples; and the projection of the coronoid process is very distinguishable through the cheek, and especially within the mouth.

When the case is a dislocation of only one condyle, the chin inclines to the opposite side; the lower teeth undergo a corresponding displacement; the mouth is open, but not so widely as when both condyles are out of their right places; the depression just in front of the ear, arising from the absence of the condyle, is only on the injured side; and the articulation of words is defective, but not altogether impeded. In a fat subject, or in a case which has existed some time, I can well conceive with Mr. Hey,\* that the lateral inclination of the chin may not be very obvious; but, in recent cases, and in persons not too fat, I should always expect to be able to notice such displacement, as it is a change which must mechanically and immediately follow the removal of one of the condyles from the glenoid cavity, while the other continues in its right situation.

If a dislocation of the lower jaw be left unreduced, the bone remains fixed in its new situation; the saliva is involuntarily discharged from the mouth, its quantity being for some time very copious, but afterwards diminishing; mastication is totally impeded; but, if the head be drawn back, liquids can be swallowed. Examples are even mentioned, in which the unreduced jaw was rendered quite immovable by an ankylosis. However, this is far from being always the case: *Monro* relates an

\* *Practical Obs. in Surgery*, p. 325.

instance, in which the patient recovered the power of elevating and depressing the jaw, without being able, however, to put the teeth completely together.\* Other examples are recorded, in which the lower jaw was gradually raised sufficiently to admit of the lips being easily brought together, and made capable of hindering the escape of the spittle. Ravaton saw a recruit, in whom one of the condyles had been out of its place two years, yet he was able both to chew and speak, though with some difficulty.

For the treatment, there are two indications; viz. to reduce the bone, and keep it reduced.

In order to accomplish the first, the patient is to be placed upon a low seat, and his head to be supported against the breast of an assistant. The surgeon being in front of the patient, is to put his thumbs, covered with a handkerchief, or a thick pair of gloves, as far as he can betwixt the back grinders on both sides of the mouth. The forefingers are then to be applied to the crowns of the last lower grinders, while the body of the bone is grasped on each side with the rest of the fingers, which are to extend obliquely under its base. While the head is steadily fixed, the surgeon presses directly downwards with his thumbs, by which means the condyles are separated a little way from the anterior part of the transverse process of the temporal bone. The condyles are then to be inclined backwards and a little downwards, by pressure applied to the back molares and the coronoid process, while the chin is inclined with the fingers upwards and forwards.

In general, as soon as the condyles slip into the glenoid cavities, the muscles suddenly shut the mouth, so that, if the surgeon were not quickly to move his thumbs towards the cheeks from between the grinding teeth, they might be injured. Hence also the prudence of protecting them with gloves. Sometimes a cork is put between the molar teeth, on each side of the mouth, and used as a fulcrum, on which the movement necessary for the reduction is effected.

According to Mr. Hey, if both sides of the jaw are pressed upon, while one side only is dislocated, the reduction is rather prevented. Therefore, before any attempt is made, he considers it best to examine carefully whether both the condyles are dislocated, and in case one only should be out of its place, to apply force merely on the side where the displacement exists. At the same time, he is inclined to think, that even when both condyles are out of their places, the application of pressure to one side of the jaw will not be injurious, as he has often succeeded in reducing one condyle first, and then the other, though

\* See also Sir A. Cooper on Dislocations, p. 359, ed. 4.

he could not put them back both together.\* The records of surgery fully prove, that dislocations of one condyle are the cases, in which the reduction is attended with most difficulty, and the nature of the accident most likely to be overlooked, or mistaken.

Should the soft parts be considerably swelled, or the violent action of the muscles frustrate the first attempts at reduction, it would be right to bleed the patient from a large opening, and even take other measures for producing temporary faintness.

The second indication, or that of keeping the bone from slipping out of its place again, is fulfilled by supporting the chin, and hindering its depression, by means of the four-tailed bandage, applied as in fractures of the lower jaw. The patient is to refrain from speaking; to live for some time on liquids; to support his chin whenever a disposition to gape is experienced; and to avoid opening his mouth wide.

#### DISLOCATION OF THE CLAVICLE.

Fractures of the clavicle are much more common than dislocations, as any one would infer, who considered the vast strength of the ligaments, the slender structure, and exposed position of the bone, and the direction, in which an external force would commonly operate upon it. A dislocation more readily happens at the sternal, than the scapular, extremity of the clavicle, on account of the greater degree of motion, which takes place in the former situation, and the weaker structure of the ligaments. The accident more frequently occurs in young subjects and females, in whom the articular cavity of the sternum is less deep and perfect, than in adults, or the male sex.† When a dislocation happens at the sternum, the clavicle is usually thrown forward; sometimes, however, backward; in which event, the symptoms may be severe and even dangerous, on account of the pressure produced by the bone on the parts situated in the anterior part of the neck. Thus one case is recorded, in which the patient's life was endangered by the pressure upon the œsophagus.‡

The dislocation of the sternal end of the clavicle forwards, may arise from the sudden application of considerable force, with a view of drawing back the shoulder, when the ligaments, and perhaps even a part of the lower tendon of the sternocleido-mastoideus muscle, are ruptured, and the inner head of the clavicle propelled forwards. It may also be produced by

\* Hey, *Practical Obs. in Surgery*, p. 326, ed. 2.

† Boyer, *Traité des Maladies Chir.* t. iv. p. 156.

‡ A. Cooper, *Surgical Essays*, part i. p. 14.



a fall upon the point of the shoulder, or upon the elbow, while this is separated from the side, the force in both cases pushing the clavicle inwards and forwards.

Some writers conceive, that a luxation of the inner end of the clavicle forwards, may arise from a fall, by which the shoulder is forcibly driven backward. Sir Astley Cooper has never known the accident caused by violence, though he thinks it might happen from a blow on the forepart of the bone, so violent as to tear the capsular and claviculacostal ligament.\* The only case seen by him, was occasioned by great deformity of the spine.

A dislocation of the inner end of the clavicle forwards, is reduced in the following way; the surgeon is to apply one hand to the inner and upper part of the arm, and the other to the external lower side of it above the elbow. The latter part is now to be inclined towards the trunk, while the upper end of the humerus is propelled outwards, by which means this bone is made to answer the purpose of a lever, the action of which immediately operates upon the clavicle. By these combined efforts of both hands, the shoulder is to be carried backwards and upwards, and the elbow forwards, so that the extension may be made in the oblique direction of the clavicle; that is to say, outwards, backwards, and a little upwards. The wedge-like cushion, used for fractures of this bone, is to be put under the axilla, as a point d'appui, which will tend to do permanently what the surgeon does with both his hands. However, if this extension should fail to bring the inner end of the clavicle into the articular cavity on the sternum, the reduction must be promoted by pressing the displaced part backwards. As soon as this is in its place again, the shoulder is to be inclined forwards, and the elbow backwards, in order to lessen the risk of the head of the bone slipping forwards again.† Lastly, the arm is to be confined in the right posture over the cushion, by means of a roller applied round the limb and trunk, together, and the elbow and forearm are to be well supported in a sling.

The dislocation of the scapular end of the clavicle is always upwards; for, the root of the coracoid process will not allow the bone to descend below the acromion. The accident is generally the consequence of a violent fall upon the shoulder, by which the scapula is forced inwards. The displacement, however, cannot happen, unless the ligaments tying the bones together be torn, and even some of those ligamentous bands, which connect the clavicle to the coracoid process. The case may be mistaken for a fracture of the clavicle.

The treatment recommended by Sir Astley Cooper, is as fol-

\* On Dislocations, p. 369, ed. 4.

† Boyer, vol. cit. p. 161.

lows: an assistant puts his knee between the patient's shoulders, and draws them backwards and upwards, whereby the clavicle is made to descend into its place again. A thick cushion is then put in each arm-pit; first, to keep the scapula from the side; secondly, to raise it; and thirdly, to hinder the margins of the axillæ from being hurt by the bandages. The shoulder is then confined inwards and backwards with a bandage, the elbow being kept well up in a sling, and at the same time inclined backwards.\* It appears to me, that the apparatus for keeping the end of the bone in its place, should act in the same manner as the power which effected the reduction; consequently, it should depress the outer end of the clavicle, raise the shoulder, incline it outwards, and hold the arm steadily against the side.

#### DISLOCATIONS OF THE SHOULDER.

No bone in the body is so frequently dislocated as the humerus; a circumstance ascribable to the shallowness of the glenoid cavity of the scapula, the looseness of the capsular ligament, the varied and extensive movements of which the arm is capable, and the force of the impulse transmitted to the head of the bone in falls and other accidents, through so long a lever as is formed by the whole limb, or even by the humerus alone. However, nature has provided some guards against the accident. In the first place, the coracoid process, the acromion, and the triangular ligament connecting these parts together, form above the glenoid cavity a kind of arch, which receives a part of the head of the humerus, and retains it in its situation, when the arm is impelled from below upwards. Secondly, as the glenoid cavity is of an oval shape, with its greatest diameter placed vertically, the elevation of the arm, the movement most frequently causing a luxation, may take place to a considerable extent, without the head of the bone, which then glides from above downwards in the glenoid cavity, ceasing to remain in contact with it. Thirdly, the tendon of the subscapularis muscle at the inner and forepart of the joint, that of the supra-spinatus above, and those of the infra-spinatus and teres minor below and behind, adhere so intimately to the capsular ligament, are so truly blended with it, and so connected with each other by dense cellular substance, that they constitute a very firm investment, well suited for resisting in a certain degree every displacement of the humerus at the points which they occupy. Fourthly, the movements of the arm do not altogether depend upon the shoulder-joint, but in a great measure upon the mobility of the scapula, which always moves together with the humerus, and in the same

\* On Dislocations, p. 375.

direction: thus, in the most extensive motions of the arm, the humerus is rarely placed in a sufficiently oblique position upon the scapula to produce a dislocation. But, notwithstanding these many contrivances for strengthening the shoulder-joint, and lessening the risk of luxations of the humerus by the impulses to which it is subjected, experience proves, that these cases are very frequent, and upon an average as numerous as all other dislocations together.\*

The dislocation of the head of the humerus *downwards* into the axilla, is the most common, and it would even be more frequent than it is, were it not that the elevation of the arm, by which the head of the bone is inclined downwards, is not the most common movement of the limb; and that a sufficiently oblique position of the bone on the glenoid cavity, for a dislocation to happen, is usually prevented by the scapula following and adapting itself to all the movements of the humerus.

In the dislocation downwards, the arm is lengthened, the elbow separated from the side, and the forearm generally extended, in consequence of the tension of the triceps muscle; the arm cannot be put near the body, nor the forearm be bent without pain; the acromion projects more than natural, and a vacancy is distinguishable under it; the fulness of the shoulder is lost, the deltoid muscle not being now duly supported by the head of the bone; the arm cannot be raised to a level with the acromion; and, when the elbow is considerably raised from the side, the head of the bone can be plainly felt in the axilla.

When the head of the humerus is thrown downwards, as is most frequently the case, it lies upon a very limited surface, quite disproportionate to its size. Hence, any exertion, or impulse, the weight of the limb itself, and the action of the muscles, are likely to produce another change in its situation. Boyer, who has had several opportunities of dissecting shoulders, dislocated downwards, has invariably found the head of the bone situated between the long head of the triceps, and the subscapularis muscle, resting upon the inside of the front edge of the scapula.† In one case, dissected by Sir Astley Cooper, the head of the bone was pushed backwards upon the subscapularis: and, in another instance, it rested upon the axillary plexus of nerves, and the artery.‡

The dislocation into the axilla frequently happens from falls, in which the elbow strikes against the ground, while separated from the side of the trunk. When a person falls sideways, he naturally puts out his arm in order to hinder his head from striking the ground. In this situation, the weight of the body

\* Boyer, *Traité des Maladies Chir.* tom. iv. pp. 174, 175.

† Boyer, vol. cit. p. 185.

‡ On Dislocations, pp. 386-388.



is upon the shoulder-joint; and as, at the same instant, the pectoralis major, latissimus dorsi, and teres major, act strongly, and pull the arm forcibly towards the chest, they make the head of the humerus slip out of its cavity, because the elbow rests upon the ground as a fixed point, while the upper end of the bone is the movable one.

On many occasions, however, the head of the humerus is dislocated downwards, not exactly in the foregoing manner; thus the arm of an ostler, as he is putting on a bridle, may be dislocated by the horse suddenly throwing up its head, and striking the under part of the elbow, while raised from the side of the body. In this last instance, the lower end of the humerus is violently thrown up, and its head propelled down into the axilla, the movement being like that of a lever.

The records of surgery furnish proofs, also, that the humerus may be luxated solely by the action of the muscles, without any fall or external violence<sup>\*</sup> being concerned in producing the accident; for, cases are related, in which the arm was dislocated into the axilla, by merely lifting up a weight, or by the convulsed action of the muscles in attacks of epilepsy.\*

In cases of dislocation of the shoulder, the capsular ligament is extensively torn; and one remark is made by Boyer, which is of importance, viz. that in dissections he has constantly found the lacerated opening in the capsule quite large enough to allow of the easy return of the head of the bone into its natural situation. This observation, which is at variance with the statements of Desault, agrees with the remarks of Sir Astley Cooper.†

In the dislocation downwards, the tendon of the subscapularis is ruptured. The tendons of the supra and infra-spinatus muscles may likewise be torn from the bone, and with them a shell of the head of the humerus may be detached.‡ Writers do not agree in their accounts of what becomes of the tendon of the long head of the biceps. According to some reports, it is displaced from its groove; according to others, it is actually ruptured. Mr. Hey tells us, that he once saw a compound dislocation of the os humeri, where the head of the bone protruded through the integuments in the axilla; and, in this case, the long tendon of the biceps was torn from its groove in the neck of the bone. However, it may be inferred, that, in ordinary dislocations downwards, this tendon is neither torn, nor dis-

\* Boyer, *Traité des Maladies des Os*, tom. iv. pp. 181, 182.

† *Surgical Essays*, part i. p. 18. Thompson found the capsular ligament entirely torn off from the neck of the humerus. See *Med. Obs. and Inquiries*.

‡ Thompson, in *Medical Obs. and Inquiries*, and Hey's *Practical Obs.* p. 311, ed. 2.



placed from its groove; for Boyer has never seen either occurrence in the cases which he has dissected;\* and Sir Astley Cooper says, that, as far as he has had an opportunity of judging from dissection, the same tendon remains unbroken.†

The dislocation next in frequency to that downwards, is the case, in which the head of the humerus breaks through the internal portion of the capsular ligament, and passes forwards immediately under the great pectoral muscle, where it lies below the middle of the clavicle, and on the sternal side of the coracoid process.

This dislocation inwards generally happens as follows: when the arm is raised so as to form nearly a right angle with the trunk, and the elbow is inclined backwards, a fall on the side may drive the head of the humerus through the inner part of the capsular ligament. However, the resistance of the ground operates very obliquely upon the elbow, and consequently, a great part of the violence is lost: hence, one reason, why the dislocation inwards is less commonly met with than that downwards.

In the dislocation inwards, the arm is somewhat shortened; the direction of the arm is downwards and backwards; the flatness of the shoulder, and the depression formed by the glenoid cavity, are very obvious; the head of the humerus can be felt under the clavicle, on the inner side of the coracoid process; and lastly, the elbow is thrown more from the side, and further back, than in the dislocation into the axilla.‡

Many surgical authors believe, that the head of the humerus cannot be dislocated backwards. "No force," says Mr. C. Bell, "can be applied in a direction to dislocate the humerus, and push its head behind the scapula, for this very evident reason, that the chest prevents the necessary position of the humerus."§ But, though an accident of this description is very uncommon, all such writers as absolutely deny its possibility, are themselves venturing beyond the bounds of accuracy. A few cases, in which the head of the humerus was dislocated backwards under the spine of the scapula, may now be found in the voluminous records of the profession. Thus, M. Fizeau|| has detailed one rare instance, which was also witnessed by Boyer; the bone, after its reduction, had a remarkable tendency to slip out of its place again; which led the latter surgeon to suppose that there was some malformation of the joint. As, however,

\* *Traité des Maladies Chir.* t. iv. p. 186.

† *Surgical Essays*, part i. p. 5.

‡ Sir A. Cooper on Dislocations, p. 399, ed. 4.

§ *Operative Surgery*, vol. ii. p. 239.

|| *Journal de Medecine, Chirurgie, Pharmacie, &c.* par MM. Corvisart, Le Roux, Boyer, &c. tom. x. p. 386.

a disposition to relapse is more or less common after all luxations of the shoulder, it does not appear to me, that there was any strong reason for the foregoing suspicion, especially as there are other cases to be met with of a similar displacement, unaccompanied with any ground for such a conjecture. I have said, that, in this uncommon kind of luxation, the head of the bone is lodged under the spine of the scapula; and in one case dissected by Delpech, the head of the bone lay under the infraspinatus muscle, in immediate contact with the scapula.\* Some other cases of dislocation backwards, are reported by Sir Astley Cooper.†

The head of the humerus is sometimes dislocated by violence directly applied to the shoulder, and, according to Boyer, in all cases of this sort, either the scapula or the humerus is also fractured. The particulars of a dislocation of the humerus backwards, produced in this manner, and attended with a fracture of the anatomical neck of the bone, were not long ago communicated to Boyer, by Dr. Houzelot, of Meaux, and the first of these gentlemen has in his possession two drawings of the case, taken from nature by one of his pupils.‡ A specimen of a dislocation of the os humeri, with fracture of the head of that bone, may be seen in the museum at St. Thomas's Hospital.§

Paralysis of the arm is sometimes the consequence of a dislocation downwards, or inwards, and is supposed to proceed from injury done to the axillary plexus of nerves by the head of the humerus. The paralytic affection may remain for ever incurable, may get well spontaneously, or yield to stimulating liniments, blisters, issues, or the moxa. A still more frequent ill-effect of luxations of the shoulder, is paralysis of the deltoid muscle; an infirmity, ascribed by some writers to laceration of the circumflex nerve.||

Many of the old methods of reducing dislocations of the shoulder, consisted altogether of means, which acted directly upon the head of the humerus, and operated upon the principle of impelling it back into the glenoid cavity by the shortest and straightest rout, without the least regard to intervening impediments. In most of these plans, either a fulcrum or an active force was applied in the axilla, and the weight of the body was then employed, as a means of propelling the head of the bone upwards, the arm being kept in a vertical position, parallel to the axis of the body. Here, it is plain, that no attempt was made to separate the head of the humerus from the lower edge

\* Précis des Maladies réputées Chirurgicales, tom. iii. p. 72.

† On Dislocations, p. 403, &c.

‡ Boyer, Traité des Maladies Chirurgicales, tom. iv. p. 183.

§ A. Cooper's Surgical Essays, part i. p. 12.

|| Delpech, Précis des Maladies Chir. t. iii. p. 73.

of the scapula, previously to the effort to get it back into the glenoid cavity; and two of the most important principles in the reduction of dislocations in general, were totally neglected, as neither extension, nor counter-extension, was practised. If it sometimes happened, that with force thus unskilfully exerted, dislocations downwards were reduced, the same practice offered no chance of success in other instances, in which the head of the humerus was either primitively or consecutively displaced inwards and forwards. In the above mode of proceeding, as the arm was placed by the side, and the shoulder drawn downwards by the weight of the whole body, the displacement in the latter kind of luxation could not fail to be increased, all the force operating upon the soft parts surrounding the head of the bone, or on the neck of the scapula, or upper portion of the humerus itself. Hence, violent contusions, lacerations, and fractures, were not unfrequently produced.

However, there can be no doubt, that the methods, which aimed directly at the reduction, without any previous extension and counter-extension, sometimes answered, or the common sense of the world would not have permitted the practice to have gone on for many ages. But, success was probably only attained, when the dislocation was downwards, the head of the humerus far removed from the glenoid cavity, and little opposition made by the muscles, the patient being either in liquor, or exhausted with fatigue. Once, as Boyer was handling the humerus of a drunken postilion, and the assistants were preparing the apparatus for reduction, the bone slipped into its place again, without any extension or counter-extension.\* Even when patients are neither faint, debilitated, nor under the influence of strong drink, if the head of the humerus be in the axilla, the reduction may sometimes be executed with a very trivial degree of extension. Thus, in the case of a corpulent woman, whose shoulder was dislocated downwards, as Mr. Hey was directing the assistants to keep the arm elevated at a right angle with the body, previously to beginning the extension, they put the arm a little upon the stretch, and on pressing on the head of the bone with his fingers in the axilla, the reduction was unexpectedly accomplished.† The same excellent practitioner once saw a luxated shoulder reduced by the mere efforts of the patient: this was an instance, in which the hand was accidentally placed on the back of a low chair, while the patient was moving his body about in different directions.‡

The ambi of Hippocrates was unquestionably a better means

\* *Traité des Maladies Chirurgicales*, t. iv. p. 196.

† See Hey's *Practical Observations in Surgery*, p. 295; also, the Case, p. 296, ed. 2.

‡ *Op. cit.* p. 297.



of reduction, than the door, or ladder-process; but from the account of it delivered in the Dictionary, the reader will perceive, that the ambi made only insufficient extension, its operation being that of a lever, by which the head of the bone was raised very nearly in a direct line upwards, and but in a little degree outwards, while nothing was done in the way of counter-extension, either with regard to the trunk, or the scapula. The old mode of reduction, effected by placing the heel in the axilla, and making extension at the wrist, is to be regarded as the best of the ancient methods. The heel makes a fulcrum, on which the head of the humerus may be moved out by approximating the elbow to the side; the heel also serves for fixing the trunk, in lieu of the usual mode of counter-extension; and the surgeon himself makes extension at the wrist. It is a practice, however, which Sir Astley Cooper speaks of in favourable terms; indeed, he generally reduces a dislocation of the shoulder, by placing his heel in the axilla, and drawing the arm at the wrist, in a line with the side of the body; and he states one reason for choosing to make the extension in this manner; viz. that when the arm is placed close by the side, the pectoralis major and latissimus dorsi muscles are relaxed, and cannot make so much resistance, as when the arm is carried from the side.\*

Notwithstanding the records of surgery afford numerous proofs of the occasionally ready and spontaneous reduction of the dislocated humerus, the surgeon must not expect the generality of cases to be rectified with the facility which happened in the examples already cited from the practice of Baron Boyer and Mr. Hey. On the contrary, it will be necessary to establish certain principles, without due attention to which the strongest efforts may sometimes fail.

As a general principle, then, I may assert with Boyer, that extension and counter-extension make an essential part of every unobjectionable process for the reduction of dislocations of the shoulder. In France, the extending force is usually applied to the wrist; in this country, just above the condyles of the humerus.† The counter-extension embraces two objects, viz. that of fixing the trunk, and that of preventing the scapula from yielding in the direction of the extending power.

The trunk is usually fixed by means of a sheet, or tablecloth, put round the chest, and the ends of which are either held by

\* See also "Cases, with Observations on Wry-Neck; and the Reduction of Luxations of the Shoulder-Joint, &c. &c." by John Kirby, 8vo. Lond. 1819.

† One advantage of applying the extending force above the elbow, is the opportunity of relaxing the biceps; for, "since that muscle is attached to the neck and coracoid process of the scapula, an extended state of the arm must hinder the repressing of the articular cavity." Hey's Practical Observations in Surgery, p. 300.



one or more assistants, or fastened to a post, or any other immovable point. The scapula may be kept back either by an assistant pressing against the acromion, and scapular end of the clavicle, or with a napkin folded longitudinally, applied over the same parts, and drawn in the opposite direction to that of the extending force.

Whether the extension be made at the wrist, or at the lower end of the humerus, the soft parts should be protected from the effects of the pressure with flannel, or a few turns of a wet calico-roller, over which the longitudinally folded table-cloth or sheet, or the quilted leather of the multiplied pulley employed for making the extension, may be placed.

Nothing can be more vague and confused, than the instructions offered in the latest practical works, respecting the direction, in which the extension ought to be made. One principle, however, is never to be forgotten, as it is a most useful guide: viz. the first design should not be to force the head of the humerus towards the glenoid cavity, but to extricate it from below the neck, or costa of the scapula, or from the track which it has taken underneath the pectoral muscle, so that the intervening parts may not constitute an impediment, which cannot be overcome without great violence, and unnecessary injury.

According to Boyer, when the dislocation is downwards, the extension should be made directly outwards, and the arm afterwards inclined downwards and a little forwards, until it touches the side. The surgeon must be careful to guide the movement, by which the assistants change the direction of the extension; and, in proportion as the wrist is inclined downwards, he is to press with his abdomen on the external side of the elbow, while, with both his hands, applied to the inner and upper part of the humerus, he inclines the head of the bone upwards and a little backwards. The success of these manœuvres will depend in a great measure upon the extension and counter-extension being well proportioned to each other, and regulated so as to promote the movements, which it is the duty of the surgeon to communicate to the limb during the operation.

When the dislocation is inwards, Boyer recommends the extension to be made horizontally outwards and a little backwards; and the limb is afterwards to be inclined forwards and downwards, until brought obliquely over the front of the chest. But, previously to the limb reaching the last position, the operator is to press with one of his hands upon the back of the elbow, and, with the other, upon the front and upper part of the humerus, in order to push the head of the bone outwards, and direct it into the glenoid cavity of the scapula.\*

\* Boyer, *Traité des Maladies Chir.* tom. iv. pp. 203-205.  
VOL. II.—2 L

When the head of the bone has quitted the axilla, and slipped under the pectoral muscle, Mr. Hey has observed, that it is brought back into the axilla more readily, if the extension be made in a direction opposite to that in which it has passed from the axilla; and that success is often greatly promoted by making the extension with the arm elevated. But when the head of the bone has advanced far under the pectoral muscle, he conceives, that strong extension may sometimes hinder the reduction, by closing the passage through which the head of the bone should return, and in such cases, he is an advocate for combining moderate extension, with the plan of moving the head of the bone freely about in all directions, pressure being also employed at the proper crisis for inclining it towards the glenoid cavity.\*

Mr. Hey has noticed the occasional impediment to reduction caused by the pressure of the edge of the glenoid cavity against the neck of the humerus. If the extension be made horizontally, the hinderance, he observes, will be increased, in proportion to the depression of the acromion. In order to obviate the difficulty, he says, the head of the humerus must be lowered by elevating the arm, while the edge of the glenoid cavity must be separated from the humerus by repressing the acromion.

Whether the extending force be applied in the French manner to the wrist, or (as is generally done in this country) just above the elbow, the position and inclination of the humerus during the operation should be the same. In short, while the extension and counter-extension are kept up by the assistants, the limb, or the humerus itself, is to be employed by the surgeon as a lever for moving the head of the bone gradually towards the glenoid cavity. In Boyer's account, we see, that this principle is acted upon, the elbow and wrist being inclined in particular directions, while the surgeon forms with his hands a kind of fulcrum, or active resistance at the upper part of the humerus. When the extension has been performed in a certain degree, many surgeons make a still more efficient fulcrum by directing one of the assistants to draw up the upper portion of the humerus with a towel placed under the limb just on the outside of the axilla. Others execute the same purpose by letting the ends of the towel, or table-cloth, be fastened over the back part of their necks, which they draw back at the period when it is desired to keep well up the superior portion of the humerus.

An excellent general rule in reducing dislocated shoulders, is to make the extension in a gradual, regular, and unremitting manner, without immoderate, sudden violence. In this way,

\* Practical Obs. in Surgery, p. 311, &c. ed. 2.

the muscles of the most athletic man may be overcome, while extension, so powerful as to be attended with risk of tearing the flesh, will fail, if not maintained for a certain time without the slightest relaxation. When the head of the bone has been brought near the glenoid cavity, the extending force should always be gradually lessened, as the lever-movement of the limb, and the action of the muscles themselves, are then the means by which the head of the bone will be replaced.

According to Boyer, when the head of the humerus has been dislocated a month, or six weeks, its reduction is seldom practicable. But, as experience proves, that the bone has been sometimes replaced at a much later period, it would be culpable not to make the attempt. A practical writer informs us, that he has in some cases reduced the humerus, after it had been dislocated two or three months, and, in one example, six months after the accident.\*†

Although I believe the employment of pulleys commendable in the hands of a skilful and prudent surgeon, and, in cases where force must be used, am inclined to prefer them to other extending means, they unquestionably require caution, lest the force exerted be such as to cause a danger of the soft parts being torn, the axillary artery ruptured, or the limb so much hurt that the risk of mortification is incurred. When Loder was studying at the Hôtel-Dieu at Rouen, a man came to the hospital, on account of some trifling complaint. M. David, the principal surgeon, perceived that the patient had also a dislocation of the left arm, which in fact had existed several months. M. David recommended a fresh trial to reduce the bone; the attempt was made with immense force, and the arm restored to its proper place again; but, the event was most disastrous, for the whole limb was attacked with such violent pain and inflammation, that, notwithstanding every means which surgery could suggest, mortification ensued, and the patient lost his life.‡

To prevent the head of the humerus from slipping out of its place again, (a tendency which always lasts for two or three weeks after the reduction,) a sling should be worn, and the arm kept close to the side.

When a dislocation is accompanied with a fracture of the humerus, the reduction is generally impracticable, especially if the solution of continuity in the bone happen to be very near the shoulder-joint. However, Delpech mentions one instance, in

\* John Kirby, Cases, with Observations on Wry-neck; the Reduction of Luxations of the Shoulder, &c. p. 53. 8vo. Lond. 1819.

† See NOTE X.

‡ Chir. Med. Beobachtungen, p. 173. 8vo. Weimar, 1794.

which a fracture of the neck of a dislocated humerus did not prevent the reduction, which was accomplished by means of a tourniquet applied over the shoulder and under the head of the bone.\*

#### DISLOCATIONS OF THE ELBOW.

The bones of the forearm can hardly be thrown forwards, without the olecranon being broken, and probably its resistance is one principal reason why such a displacement is very uncommon.† The kind of dislocation, most frequent at the elbow, is that in which the upper heads of the radius and ulna are displaced backward. Its occurrence is facilitated by the small size of the coronoid process, which slips behind the os humeri into the lower portion of the cavity, naturally destined for the reception of the olecranon in the extended state of the forearm. In some instances, the coronoid process is fractured; a complication which is said not to admit of the ulna being preserved in its natural situation.‡ The lower end of the humerus is situated upon the anterior surface of the radius and ulna, between the coronoid process and the insertion of the tendon of the biceps muscle; and the lateral ligaments are torn. The brachialis is excessively stretched. The olecranon and part of the triceps project backward to an unusual distance, causing an appearance, as if the arm were broken above its lower third. The biceps, pronator teres, supinator brevis, and triceps, are all in a state of tension; and, in consequence of the forearm being thus drawn in opposite directions by the antagonist muscles, it remains in a half-bent position. Sometimes the displacement is much more extensive, and the injury of the soft parts greater. Thus, the lower end of the humerus may be thrown further from the elbow, along the anterior surface of the radius and ulna, which displacement cannot happen without the laceration of several of the preceding muscles. In cases of this description, the humerus has sometimes been driven through the integuments, and even the brachial artery has been ruptured.§

The next most frequent dislocation at the elbow consists in the ulna being pushed into the place of the radius upon the lower end of the humerus. In this case, the olecranon is brought nearer to the external condyle, the distance between the olecranon and internal condyle being of course much greater than natural. From the perusal of books, one might suppose that all dislocations at the elbow were so obvious, as not to admit

\* *Précis des Maladies réputées Chirurgicales*, tom. iii. p. 80.

† Only a single instance of this luxation, unaccompanied with fracture of the olecranon, is said to be on record. *Delpech*, vol. cit. p. 81.

‡ *Sir A. Cooper, Surgical Essays*, part i. p. 12.

§ *Delpech*, vol. cit. p. 82.



of the possibility of mistake. However, this is far from being true; for, such accidents are rarely produced without great violence, the usual consequence of which, is a rapid and considerable swelling, by which the form of the joint is very much concealed. I have seen several cases where the patients were permanently crippled, because the nature of the accidents had not been understood at first, and no attempt at reduction made. One common cause of mistake is the feel of a crepitus, when the forearm is moved, and the surgeon is led by this circumstance to suppose the case a fracture; but, he should remember, that most dislocations at the elbow are attended, as well as fractures, with this symptom. I once saw a young gentleman whose ulna had been pushed on the external condyle about a month, yet the efforts of two very eminent surgeons in London could not now produce the slightest diminution of the displacement.

In the lateral dislocation of the head of the ulna outwards, the radius is forced off the lesser articular surface of the humerus; this surface, and the outer side of the articular pulley, being now in contact with the sigmoid cavity of the ulna. The internal portion of the trochlea of the humerus is no longer applied to the ulna, and forms a prominence at the inner side of the elbow, while the olecranon and coronoid process, being propelled outwards, do not correspond to the cavities in the humerus naturally intended for their reception; and hence, they seriously limit the flexion and extension of the forearm. As the point of the olecranon constantly touches the back of the humerus, the forearm remains slightly bent; and the brachialis, biceps, and triceps, are in a state of tension. A similar condition of the pronator teres, and of nearly all the muscles situated on the palmar side of the forearm, will also explain the fixed pronation of the hand, and the bent state of the fingers.\*

The lateral dislocation of the heads of the ulna and radius inwards, is more uncommon, and generally incomplete. The student will recollect, that by the term *incomplete*, in reference to luxations, surgeons mean that the articular surfaces are still in partial contact; a state which is well accounted for, in lateral dislocations of the elbow, by the great extent of the surfaces of this joint in the transverse direction. In the dislocation inwards, the upper head of the radius is thrown upon the trochlea of the humerus, and more or less of the sigmoid cavity of the ulna is forced away from the latter bone, and forms a projection at the inside of the elbow. The olecranon and coronoid process being now placed more internally, than the

\* Delpech, Précis Élémentaire des Maladies Chirurgicales, tom. iii. p. 83.

depressions destined for them in the humerus, cannot freely execute their usual movements, more especially the olecranon, which being the longest of the two, keeps the arm constantly bent, though in a less degree than in the lateral dislocation outwards. The short supinator, being on the stretch, rotates the radius outwards; while the brachialis, biceps, and triceps, are displaced inwards, and very prominent. Lastly, the olecranon is nearer the inner condyle than natural. Lateral dislocations of the upper heads of the radius and ulna are always attended with rupture of the lateral ligaments, and generally also with a laceration of the annular ligament of the radius, which is so intimately connected with the external lateral ligament, as to be as it were a part or production of it. That it is frequently torn, is proved by the fact, that after a lateral dislocation of the elbow has been reduced, it is not at all uncommon for the surgeon to perceive a distinct luxation of the radius yet claiming his assistance. And, as Delpech observes, the radius and ulna can only preserve their due relation to each other in dislocations of the elbow, when the external lateral ligament happens to break above its connexion with the annular ligament.

Besides the kinds of luxation at the elbow already specified, the ulna alone may be dislocated, or the radius luxated either forwards or backwards, without any displacement of the ulna. Examples also sometimes occur, in which the radius is driven forwards and the ulna backwards, with or without a fracture of the coronoid process.

When proper extension is made, recent dislocations of the elbow are easily reduced. In the luxation of the ulna and radius backwards, an assistant is to take hold of the arm, and fix the humerus, while another makes extension at the wrist in the axis of the forearm. Then the surgeon slowly bends the elbow, and the reduction immediately follows.

The arm should afterwards be kept in a sling; and if there be much swelling, venesection, leeches, cold washes, low diet, and purging, will be proper. The tendency to displacement is slight; but if, from the separation of the articular surfaces having been greater than usual, and attended with extensive laceration of the ligaments and muscles, and fracture of the coronoid process, the joint should require mechanical support, it must be obtained from the use of a bandage, compresses, and a splint for preserving the radius motionless. In general, however, the pressure of any apparatus is injurious, while inflammation is present, and afterwards it becomes unnecessary, with any view to the prevention of another displacement. In about a fortnight, when the inflammation and swelling have subsided, the forearm should sometimes be gently bent and extended, in order to hinder ankylosis.

DISLOCATIONS OF THE METACARPAL BONE OF THE THUMB FROM  
THE OS TRAPEZIUM.

From the various directions in which the metacarpal bone of the thumb is movable, it seems capable of being dislocated off the trapezium, either backwards, forwards, inwards, or outwards; the first and third forms of the accident, however, are the most common. The usual cause of the first is external violence, by which the metacarpal bone is suddenly and immoderately bent towards the palm, as may occur in a fall upon the radial edge of the hand.

The nature of the accident may be known by the tumour formed by the displaced head of the bone; by the flexion of the thumb and metacarpal bone; by the impossibility of extending them; and the pain accompanying every such attempt. The considerable swelling, which soon follows, sometimes obscures the case; and if, in this circumstance, the surgeon merely adopt measures for the removal of the inflammation, the bone either becomes in a short time irreducible, or, if reducible, a permanent tendency to slip out of its place again is left,—the effect of the consolidation of the capsular ligament, while the bone was in a state of displacement.

The reduction of a dislocation of the metacarpal bone of the thumb backwards, is accomplished as follows: while one assistant pulls the thumb, and another fixes the hand, by taking hold of the wrist, the surgeon compresses with both his thumbs the displaced head of the bone, and pushes it towards the palm, into its natural situation again. Some linen wet with the liquor plumbi acetatis dilutus may then be applied round the part, and a return of the displacement is to be prevented by laying a compress and piece of strong pasteboard along the posterior surface of the bone, properly secured with tape.\*

In the cases, which Sir Astley Cooper met with, the head of the metacarpal bone was forced inwards, between the trapezium and metacarpal bone of the forefinger, so as to make a protuberance towards the palm; the thumb was inclined backwards, and could not be brought towards the little finger. In the reduction, the extension must be kept up a considerable time, and then the thumb moved towards the palm.†

## DISLOCATIONS OF THE THUMB.

With respect to these cases, I am anxious to notice a few particulars, not explained in the Dictionary.

The phalanges of the thumb are most liable to be dislocated backwards, and, in certain individuals, the tendency to

\* Boyer, *Traité des Maladies Chirurgicales*, tom. iv. p. 268.

† On Dislocations, &c. p. 489.

this kind of displacement is so considerable, that they can produce and remove it at pleasure by the mere contraction of the muscles. In a letter, dated the 6th of February, 1819, and received by me from Mr. Dunn, an intelligent surgeon now settled at Scarborough, (to whom I here beg leave to acknowledge my obligations for many other valuable communications,) he says, "my pupil, who has written this copy of my letter to you, can spontaneously dislocate the thumb of his left hand at the metacarpal joint, by the action of the flexors alone, the metacarpal bone being the upper. By the action of the extensors, he can again replace it; but, the least extension of the thumb by an assistant, or himself, gives him great pain, without accomplishing the reduction. He can by the same means dislocate the second phalanx of the thumb from the first. He complains of no weakness in his hand, and indeed, can exercise the left hand better than the right." Boyer tells us that he has met with several persons, in whom the first phalanx of the thumb had this tendency to slip backwards; and he professes his inability to say, whether it depended upon relaxation of the ligaments, or particular conformation of the articular surfaces.\*

The first phalanx of the thumb is apt to be dislocated backward by immoderate extension of the joint. The base of the phalanx glides backward behind the head of the first metacarpal bone, lacerating the capsular ligament, stretching the tendons of the extensor muscles, and changing the direction of the lateral ligaments, without breaking them.

The nature of the case may be known by the head of the first phalanx of the thumb projecting back, so as to form nearly a right angle with the metacarpal bone; by the tumour produced in front of the joint by the head of the latter bone; by the bent position of the second phalanx caused by the tense state of the tendon of the flexor longus pollicis; and by the impossibility of either bending or extending the first phalanx.

In many surgical books, the reduction of the first phalanx of the thumb, when thrown backwards off the head of the metacarpal bone, is described as attended with no difficulty, when done soon after the occurrence of the accident; but, all writers agree, that if the case be neglected, it quickly becomes irreducible.

With regard to the general facility of reduction, in an earlier stage, modern experience proves, that even this is far from being the truth; and, according to the observations of the late Mr. Hey,† a peculiar difficulty attends the reduction, whenever the head of the metacarpal bone, which is joined to the first

\* Boyer, *Traité des Maladies Chir.* tom. iv. p. 273.

† *Practical Obs. in Surgery*, p. 327, edit. 2.



phalanx of the thumb, is completely luxated, and depressed towards the palm of the hand. He informs us, that, when he was a pupil at St. George's Hospital, in 1758, a patient with such an accident was dismissed incurable; Mr. Bromfield at the same time stating to the pupils another instance, in which the extending force had been increased to such a degree, that the surgeon tore off the thumb at the second joint. Nor could Mr. Hey himself, by means of extension and pressure, or twisting the bone about, accomplish the reduction of a similar case, which was brought to him by another surgeon, in 1767.

The cause of the difficulty in the reduction is variously explained by different writers. Boyer refers it partly to the little space which the thumb presents for the counter-extension, and partly to the resistance made by the strong muscles around the joint.\* On the contrary, Mr. Hey, in endeavouring to account for the impediment, adverts to the wedge-like shape of a transverse section of the head of the metacarpal bone, with the narrowest part towards the palm of the hand, and makes some reflections on the effect of the position of the tubercles situated upon the head of the same bone, the two nearest the palm being only three-eighths of an inch from each other, while those towards the back of the bone have an interspace of five-eighths of an inch. Supposing, therefore, the head of the metacarpal bone to be pressed forcibly between the lateral ligaments, towards the palm of the hand, it passes like a wedge between these ligaments; and having passed between them, it cannot return, as the posterior broad part of the bone presents itself to the more contracted aperture between them. In some dislocations of the foregoing kind, which came under Mr. Hey's management subsequently to the publication of his first edition, he succeeded in reducing the bone by pressure without extension. The pressure should be made against the luxated extremity of the first phalanx, which lies upon the back part of the metacarpal bone.†

In one instance, where a dislocation of the first phalanx of the thumb backwards from the metacarpal bone had continued about twelve days, and could not be reduced, Desault recommended an incision to be made behind the extremity of the luxated bone of the thumb, and a spatula, or some other lever, to be introduced for the purpose of effecting the reduction. This suggestion, however, was not adopted. Mr. Evans, of Ketley, near Wellington in Shropshire, met with two cases of dislocation of the metacarpal bone towards the palm of the hand, and, in both these examples, the reduction could not be

\* *Traité des Maladies Chir.* tom. iv. p. 274.

† Hey's *Practical Observations in Surgery*, pp. 327-329, edit. 2.

performed with extension, notwithstanding repeated trials were made. Mr. Evans was therefore induced to cut down upon the end of the bone, thrust it out of the wound, and saw it off. In both cases, the reduction was then effected with the greatest facility. The wound was immediately closed, the parts united favourably, and nearly the perfect use of the thumbs was recovered.\*

Instead of the preceding method of treatment, were I to meet with a case, which could not be reduced in the manner advised by Mr. Hey, I should prefer following Mr. C. Bell's suggestion, which is to insinuate a couching needle obliquely under the skin, and divide with it one of the lateral ligaments, which form the main difficulty to reduction, by their embracing the head of the bone.†

Although extension made precisely in the line of the axis of the two phalanges of the thumb, must tend to lock the head of the first phalanx still more firmly, it appears to me, that, if it were made so as to incline the latter bone towards the palm of the hand, it might contribute to facilitate the effect of direct pressure on the head of the displaced phalanx. Thus, Boyer, after injudiciously recommending straight extension, finishes with a more useful piece of advice; "As soon as the surgeon perceives, that the dislocated phalanx yields to the extending force, he is to press upon the base of the phalanx with both his thumbs, and push it forwards and downwards, while the assistant, who makes the extension, inclines this phalanx into the bent position."‡

My friend, Mr. Carwardine, met with a case of compound luxation of the anterior head of the first phalanx of the thumb, the posterior head of the second phalanx was left resting upon the back of the first phalanx, while the extremity of the thumb stood upright. After repeated fruitless attempts at reduction by means of extension, he succeeded by pushing forwards that extremity of the second phalanx, which rested upon the first, until he had brought the articulating surfaces into contact. He then turned the second phalanx round the projecting extremity of the first, and easily accomplished the reduction.§

Sir Astley Cooper puts a thin piece of wet wash-leather round the first phalanx; then applies a tape, about two yards long, fixing it with the clove-hitch notch; an assistant makes counter-extension; and the extension is made with the tape. When this plan fails, the multiplied pulley is employed.||

\* Hey's Practical Observations in Surgery, p. 330.

† Operative Surgery, vol. ii. p. 261.

‡ *Traité des Maladies Chir.* t. iv. p. 274.

§ See Hey's Practical Obs. p. 331.

|| On Dislocations, p. 494.

## DISLOCATIONS OF THE THIGH-BONE AT THE HIP.

Dislocations of the thigh-bone at the hip-joint are of four kinds. In the first, the head of the bone is thrown upon the obturator foramen; in the second, into the upper part of the groin, upon the os pubis; in the third, upon the dorsum of the ilium; and, in the fourth, upon the sacro-ischiatic notch.

Whatever may be the point of the brim of the acetabulum, over which the head of the bone escapes from that cavity, the displacement can never happen without producing a laceration of the capsular ligament.\* In the dislocation upon the obturator foramen, perhaps the ligamentum teres may not always be ruptured;† but, in other examples, it is almost invariably lacerated;‡ and it is even sometimes broken in the luxation upon the obturator foramen, as is put out of all doubt by a preparation in the collection at St. Thomas's hospital. Indeed, Sir Astley Cooper states, that this is always the case, because the dislocation happens whilst the thighs are widely separated, and the ligamentum teres on the stretch, which is ruptured before

\* This statement, with respect to all common cases, I believe to be correct: but there are certain cases, which form exceptions. Thus, luxations without laceration of ligaments, may arise from paralysis of such muscles as naturally strengthen a joint, as we find exemplified in two cases recorded by Sir A. Cooper. (*Surgical Essays*, part ii. p. 10.) Another modern writer also remarks: "From the extent of relaxation, that I have sometimes observed in the ligaments of the large joints, there seems to be ground for believing, that complete, as well as incomplete luxation, may in some cases occur at the shoulder, without laceration of the capsule, particularly as there is demonstrative evidence of its occasionally taking place in the hip-joint." See *Practical Obs. in Surgery, &c.* by John Howship, p. 464. 8vo. Lond. 1816.

† Boyer, *Traité des Maladies Chir.* t. iv. p. 280. I infer that the latter part of the following statement must be a mistake: "The round ligament has a tendency to prevent dislocations in all directions, but particularly the dislocation downwards." A. Cooper's *Surgical Essays*, part i. p. 26.

‡ The description given by Mr. Howship of some preparations in Mr. Heaviside's museum, does not appear to me to warrant the inference, that, in these particular cases, which were all of them unreduced dislocations upward and backward, the ligamentum teres had not been ruptured. This conclusion can hardly be admitted from a mere view of the dried bones, unaccompanied with that ligament. Neither does the account, which Mr. Howship has given of another preparation in the same collection, amount in my mind to a satisfactory proof, that, in the luxation of the thigh-bone there alluded to, the fabric of the joint was entire in respect to the ligaments. However, lest what I now say may be incorrect, I should wish the candid reader to consult Mr. Howship's work, "*Practical Observations in Surgery and Morbid Anatomy*," pp. 465-478, &c. Delpech mentions some rare examples, in which the ligamentum teres was not torn in the luxation upwards and backwards, and other instances, in which it was ruptured in the dislocation upon the obturator foramen. See *Précis des Maladies réputées Chirurgicales*, t. iii. p. 110.

the head of the bone is quite out of the acetabulum.\* He differs, therefore, from Boyer, who states that the ligamentum teres is ruptured only when the head of the bone is very extensively displaced.†

One of the most frequent luxations of the thigh is that in which the head of the bone is thrown upon the obturator foramen, viz. downwards and forwards. Flajani,‡ Callisen,§ and many other distinguished surgeons, regard the dislocation in this direction as the most common. Their accuracy, however, must be doubted; for, Boyer assures us, that the dislocation upwards and backwards on the ilium, is as often met with as that downwards and forwards on the obturator foramen, and in his own practice has occurred with even greater frequency.|| While Mr. Hey has seen only three luxations upon the obturator foramen, he has met with seven upwards and backwards.¶ I have not seen more than eight dislocations of the thigh, of which number only two were upon the obturator foramen. Sir Astley Cooper, whose statements are generally founded upon ample experience, concurs with Boyer and Hey in representing the luxation on the dorsum of the ilium as the most frequent.\*\*

The following are the symptoms of a dislocation upon the obturator foramen: a hard tumour, caused by the lodgment of the head of the thigh-bone upon the obturator externus muscle and obturator ligament, may be felt at the inner and upper part of the thigh towards the perinæum. According to Sir Astley Cooper, the limb is two inches longer than the other.†† According to Mr. Hey, three or four inches.‡‡ The generality of surgical writers represent the toes and knees to be turned outwards;§§ an effect, which is ascribed to the tension and elongation of the muscles concerned in rotating the limb in this direction. There appears, however, to be no regularity attending the position of the toes. In the cases which fell under the notice of Mr. Hey, the foot of the affected limb was not turned outward.|||| The foot, says Sir Astley Cooper, though widely

\* On Dislocations, p. 56, ed. 4.

† Vol. cit. p. 283.

‡ Collezione d'Osservazioni e Riflessioni di Chirurgia, t. i. p. 62.

§ Systema Chirurgia Hodiernæ, vol. ii. p. 585. 8vo. Hafniæ, 1800.

|| Traité des Maladies Chir. t. iv. p. 280.

¶ Hey's Practical Observations in Surgery, p. 314, ed. 2.

\*\* Surgical Essays, part i. p. 27; also, on Dislocations, p. 33.

†† On Dislocations, p. 56.

‡‡ Practical Obs. in Surgery, p. 321, ed. 2.

§§ Flajani, Collezione d'Osservazioni e Riflessioni di Chirurgia, t. i. p. 64; Boyer, Traité des Maladies Chirurgicales, t. iv. p. 285; C. Bell, Operative Surgery, vol. ii. p. 275, &c.

|||| A degree of ambiguity is thrown upon Mr. Hey's statement, by his adding "with respect to the knee;" but, as the toes can never be turned



separated from the other, is generally turned neither outwards nor inwards, although he has seen a little variation in this respect in different instances: he thinks, therefore, that the position of the foot does not mark the accident, the diagnostic symptoms being the bent position of the body, the separated knees, and the increased length of the limb.\*

While the knee and foot of the luxated limb are widely separated from the other member, the upper part of the affected thigh is nearer to the opposite thigh than natural, and the trochanter major less prominent. The glutæi muscles are drawn downwards, put upon the stretch, and considerably flattened. The pyriformes are elongated and tense. Hence, the limb is drawn away from its fellow, and cannot be put near it without great difficulty. The triceps is also in a state of considerable tension, forming a hard mass, which reaches from the os pubis to below the middle of the thigh. The bent position of the body, specified by Sir Astley Cooper as one of the most constant symptoms, is owing to the tension of the psoas and iliacus internus muscles. When the case is examined, as the patient stands up, the thigh seems evidently more forward than usual.

Whether the foot be somewhat inclined outward, or not, in the dislocation upon the obturator foramen, the case cannot be mistaken for a fracture of the neck of the thigh-bone, because this last accident is never attended with any elongation of the limb, but almost always with a manifest shortening of it.

The dislocation of the head of the thigh-bone forwards and upwards upon the os pubis, is considered by Sir Astley Cooper as more easy of detection than any other luxation of the thigh. The limb is an inch shorter than the other; the knee and foot are turned outwards; and cannot be rotated inwards; but, there is a slight flexion forwards and outwards, and in one instance, which had been long unreduced, the motion at the knee backwards and forwards was full twelve inches. The striking criterion of the case is the facility with which the head of the thigh-bone may be distinctly felt upon the pubes, above the level of Poupart's ligament, and on the outer side of the femoral artery and vein.†

In this kind of dislocation, the head of the thigh-bone rests upon the horizontal ramus of the os pubis, and, in old unreduced cases, dissections prove, that it even tears up Poupart's ligament so as to get between it and the last mentioned bone, occupying a situation also between the sheath of the crural vessels

out with respect to the knee, in a mere dislocation of the hip, I conclude, that the expression has been inadvertently employed.

\* Surgical Essays, part i. p. 37.

† Surgical Essays, part i. p. 45, and On Dislocations, p. 83.

and the anterior inferior spinous process of the ilium.\* According to Boyer, when the displacement is recent, the head of the os femoris lies between the os pubis, and the mass common to the psoas and iliacus internus muscles, which is raised up by it. The upper portion of the capsular ligament and the ligamentum teres are lacerated.† The glutæi, pyramidalis, gemelli, obturatores, and quadratus, are tense and elongated, while all the other muscles about the joint are relaxed. Boyer says, the femoral vessels and anterior crural nerve are pushed inwards, and perhaps at the same time lifted up by the head of the bone; but, as this state of parts is not specified in the account given by Sir Astley Cooper of a case dissected and preserved in the museum at St. Thomas's Hospital, this part of Boyer's description needs confirmation. He allows, however, that the compression of the vessels and nerves is never powerful enough to cause risk of gangrene, when the reduction is delayed; a truth well proved by the three unreduced cases which fell under the notice of Sir Astley Cooper.‡

This last species of dislocation is mostly occasioned by some violent effort, by which the os femoris is forced backwards, and the pelvis forwards. It may take place when a person puts his foot into some unexpected hollow in the ground, and his body at the moment is bent backwards.

The most frequent dislocation of the head of the thigh-bone is upwards and backwards upon the dorsum of the ilium, under the glutæus minimus. According to Sir Astley Cooper, the limb is from one inch and a half to two inches and a half shorter than the other, and the toe rests against the tarsus of the other foot. The knee and foot are turned inwards, and the knee is a little advanced upon the other; the latter effect arising from the tense state of the triceps and gracilis. When an attempt is made to separate the dislocated from the sound limb, it is found to be firmly fixed in its new situation, with respect to any movement, or rotation outwards, but the thigh can be slightly bent across the other. The constant rotation of the member inwards is ascribed by surgical writers to the lower and inner portion of the capsular ligament remaining entire, and keeping the fore-part of the trochanter major close to the acetabulum.§ Unless much blood be effused under the skin, the head of the bone can be felt moving upon the dorsum of the ilium, when the knee is rotated inwards; the trochanter major is much nearer the spinous process of the ilium, and less prominent, than natural.

In a fracture of the neck of the thigh-bone, the knee and foot

\* A. Cooper, Surgical Essays, part i. p. 46.

† Ibid. p. 46.

‡ Surgical Essays, part i. p. 45.

§ Delpech, Précis Elementaire des Maladies Chir. tom. iii. p. 112.

are generally turned outwards; the trochanter is drawn backwards; and the limb can be readily bent towards the abdomen, although with some pain. But, what particularly merits attention is, that the limb, which is shortened from one to two inches by the contraction of the muscles, can be made of the same length as the other by a slight extension, and, when the extension is discontinued, the leg is again shortened. When the limb is extended and rotated, the surgeon may also feel a crepitus, which cannot be perceived while the limb is moved in the shortened position.\*

A dislocation of the os femoris downwards and backwards must be exceedingly rare, if it occur at all; for, it appears from the statement of Sir Astley Cooper, that no case of this kind has occurred in his own private practice, or at St. Thomas's or Guy's Hospital, during the last thirty years; and hence he is inclined to doubt the possibility of the accident.† He remarks, that the dislocation of the ischiatic notch has been incorrectly described by writers, all of whom, as far as he knows, represent the limb as lengthened. The error, he says, must have arisen from their having examined the pelvis separated from the skeleton, and seen that the ischiatic notch was below the level of the acetabulum, when the pelvis was horizontal; but, he observes, that, in the natural oblique position of the pelvis, the notch in question is above the acetabulum, at least as regards the horizontal axis of the two cavities.‡ What Boyer says about luxations downwards and backwards, so far concurs with the observations of Sir Astley Cooper, that primitive dislocations in this direction are represented as in all probability never taking place; because they could not happen, unless the thigh were bent and carried inwards further than the resistance of the trunk and opposite member would allow. However, the Baron is of opinion, that such displacement of the head of the thigh-bone may occur consecutively, and follow the luxation upwards and outwards, when the thigh by any case is put, after this accident, in a state of flexion and adduction. Under these circumstances, he thinks it possible for the head of the bone to slip downwards in front of the upper part of the ischiatic notch;§ but, that it can never glide down as low as the junction of the ilium with the ischium, much less below this point.

With regard to the prognosis in luxations of the thigh, it embraces the consideration of the bad symptoms which may

\* A. Cooper, *Surgical Essays*, part i. p. 28.

† Ibid. p. 27.

‡ Op. cit. part ii. p. 13.

§ Sir Astley Cooper would not regard this case as strictly a dislocation *downward* and backward, because in the natural position of the pelvis, the level of the ischiatic notch is rather higher than that of the acetabulum.



originate from the injury; the difficulty of reduction; and the consequences, when the head of the bone is left unreduced. In reflecting upon the strength of the hip-joint, and the number and force of the surrounding muscles, one might be led to suppose, that the head of the os femoris could not be displaced from the acetabulum, without great mischief being done to the soft parts, followed by severe symptoms. In this respect, however, experience proves, that dislocations of the femur are not attended with more danger than those of the shoulder. After the reduction, the pain and swelling generally soon subside; and in about eight or ten days, the patient is sometimes able to walk again.\* But though the generality of cases are not followed by such inflammation, as occasions any important consequences, we learn from a practical work, that suppuration may take place after the reduction, and the patient die.† Even when the case is not reduced, the pain and swelling commonly soon go off, and the limb gradually regains some power of motion.

The reduction of luxations of the thigh-bone at the hip is attended with more difficulty than that of the generality of dislocations. The distance to which the head of the femur is removed from the acetabulum, and the large number and strength of the muscles, almost constantly make the business of reduction troublesome. The degree of difficulty, however, varies in different cases and different individuals. In thin, weak, delicate persons, the head of the bone can be replaced with much less trouble than in strong athletic subjects, whose muscles are capable of making vast resistance. The dislocation downwards and inwards, and that upwards and inwards upon the horizontal branch of the os pubis, are generally more easy of reduction, than the case upwards and backwards.

Recent luxations at the hip are more easy to reduce, than such as have existed some time, many of which indeed are quite irreducible. A question here arises, what is the period, at which an attempt at reduction becomes useless, and all chance of success is at an end? This is a question, to which, in the present state of surgical knowledge, an exact answer cannot be given. The records of surgery furnish one extraordinary instance, in which a luxation at the hip was successfully reduced, after it had continued two years, the nature of the accident not having been previously made out.‡ I believe the attempt at

\* Boyer, *Traité des Maladies Chir.* tom. iv. p. 290.

† A. Cooper, *Surgical Essays*, part i. p. 5.

‡ See Guyenot, *Mémoire sur les anciennes Luxations*; *Mémoires de l'Académie de Chirurgie*, tom. v. 4to. After a careful perusal of the case, here adverted to, I am disposed to think, that the particulars given by the author make out an example of diseased hip-joint where the event was



reduction will hardly ever succeed after three months. Two cases of late reduction are mentioned by Sir Astley Cooper: in one, Mr. Bennett, of Chester, replaced the head of the femur, after it had been on the *dorsum ilii* two months, the object having been materially promoted by the effects of opium, bleeding, and nauseating doses of the tartrate of antimony. The reduction, however, was followed by an inflammation of the hip, of which the patient had not recovered at the time when Mr. Bennett reported the particulars. The other example of late reduction was sent to the Medical and Chirurgical Society by Mr. Tripe, of Plymouth: the bone had been out of its place seven weeks.\* The period, when all chance of success ceases, probably varies in different individuals; for, in one case related by Sir Astley Cooper, every attempt at reduction was found unavailing after five weeks.†

Leaving a dislocation of the thigh permanently unreduced, is a mistake of the most serious nature, as it renders the patient a cripple for life. An unreduced dislocation of the femur, however, does not make the patient for ever afterwards absolutely incapable of standing or walking, though it disqualifies him from doing so with any degree of ease. Nothing can be more interesting to the philosophical surgeon, than the observation of the efforts, which nature is constantly making for the reparation of injuries affecting the human body, and, perhaps, if there are any examples, which more strikingly than others illustrate such efforts, I believe they are to be found in cases of unreduced dislocations of the hip. Here, the changes wrought by the hand of nature, are truly surprising, a new socket being gradually constructed‡ for the displaced head of the bone, and the patient recovering the power of standing and walking, at first upon crutches, and at length with a stick, or even without any such assistance.§

favourable, rather than the reduction of a luxation of the head of the thigh-bone at the end of two years. With respect to another instance of supposed reduction by the effects of an accidental fall, after the bone had been out of its place five years, I join Sir Astley Cooper in believing a mistake must prevail in the account. On Dislocations, p. 91, ed. 4.

\* A. Cooper, *Surgical Essays*, part ii. pp. 17, 18.

† *Op. cit.* part i. p. 25.

‡ The new cup, which is thus formed, sometimes so completely surrounds the neck of the bone, as to prevent its being removed from it without fracture. A. Cooper, *Surgical Essays*, part i. p. 7.

§ The limits of this work prevent me from entering into a particular description of the changes which happen when dislocations of the femur are left unreduced; but I feel pleasure in referring to some modern publications, in which the subject is considered; Boyer's *Traité des Maladies Chir.* t. iv. p. 294, &c. 8vo. Paris, 1814; Sandifort's *Museum Anatomicum*, vol. i. fol. Lugd. 1793; A. Cooper, *Surgical Essays*, part i.; Howship's *Practical Observations in Surgery and Morbid Anatomy*, 8vo. Lond. 1816.

With the view of promoting the reduction of the dislocation upwards and backwards, Sir Astley Cooper recommends free venesection, and then placing the patient in a warm bath, at the temperature of  $100^{\circ}$ , and gradually increasing the heat of the water, until he begins to be faint. While he is in the water, he is also to be given a grain of tartarized antimony every ten minutes, until nausea is excited, when he is to be removed from the bath,\* put between blankets, and placed on a firm table, or a mattress on the floor, in order that the displaced bone may be put back into its socket. There can be no doubt, that the means here advised will facilitate the reduction. The bleeding in particular seems quite proper as a general practice, because it may have an additional good effect, in preventing subsequent inflammation of the soft parts about the injured hip; and I think, therefore, that it should only be dispensed with in persons whose constitutions are not in a state to bear the loss of blood without serious detriment. But, with regard to the warm bath and nauseating doses of tartar of antimony, proper as they are in cases of difficulty, it may be questionable, whether they ought always to be put in practice before any attempts at reduction are made, because the bone may frequently be replaced with moderate trouble, and then some delay and a good deal of annoyance will be avoided. However, when the first endeavours of the surgeon do not succeed, the propriety of weakening the patient, not only by bleeding, but also by the warm bath, and nauseating doses of tartar of antimony, cannot be doubted. Also, whenever the bone has been some days, or weeks, out of its place, more trouble than usual is to be expected, and, therefore, every possible means of incapacitating the muscles, by bringing on a temporary prostration of strength, would then be right. In common instances, I should be content with bleeding the patient, and then proceed without further loss of time to the reduction.

In the dislocation upwards and backwards, the patient is to be laid on his back, upon a large firm table, strong four-posted bed, or the floor, with a mattress or blanket under him. The pelvis must be fixed by proper means, or, what amounts to the same thing, counter-extension equal to the extending force must be performed by the assistants. These last very necessary proceedings are fulfilled by means of a sheet, which is to be folded longitudinally, its middle being applied between the pudenda and the thigh, and its two ends being either fastened to some

\* A. Cooper, *Surgical Essays*, part i. p. 30. This employment of venesection, the warm bath, and emetics, was also particularly recommended by Loder. (See *Chir. Med. Beobachtungen*, i. b. p. 170. 8vo. Weimar, 1794.)

immovable point, generally to the bed-post, or leg of the table on the opposite side, behind the patient's head, or given into the hands of the assistants, who are to make the counter-extension. This is the method usually selected in this country. In France, surgeons fix the pelvis, or make the counter-extension, by placing the middle of the sheet between the pudenda and the upper inner part of the sound limb, taking care to interpose soft materials, in order to prevent the ill effects of pressure. One end of this sheet is carried over the groin, and the other over the buttock, and, where they both meet over the crista of the ilium, they are twisted together, and then given into the hands of the assistants. The evident advantage of thus applying the sheet for fixing the pelvis, or making the counter-extension, is, that its ends are more out of the surgeon's way, and cannot slip, so as to form any hindrance to the reduction. When the counter-extending sheet, or girt, is applied in this manner, however, it is so far out of the line of extension, that, unless another contrivance be also adopted, the side of the pelvis, on which the dislocated bone is situated, would be drawn downwards by the extending force. The second contrivance here alluded to, is another sheet, or table-cloth, folded longitudinally, or any broad strap, or girt, the middle of which is to be applied just below the crista of the ilium, on the injured side, and the ends carried round to the opposite side of the pelvis, just above the crista of the ilium, where they are to be twisted together, and then put into the hands of one or two of the assistants, whose duty it is to draw them at the time of the reduction, in the direction in which they have been placed. I believe, unless two sheets, or girts, be thus used for fixing the pelvis, the object can never be strictly answered, though often in a sufficient degree to enable the surgeon to effect the reduction. In all difficult cases, however, the best plan is to make the counter-extension perfect, by employing a folded table-cloth, or band, for effectually hindering all yielding of the pelvis on the injured side.

The French surgeons apply the extending means just above the malleoli, and thus have the advantage of a very long lever, which, at a certain period of the extension, is sometimes of considerable utility in facilitating the inclination of the head of the bone in the most desirable direction. However, whether the extension be made thus low down, or, as is customary in England, just above the condyles of the femur, flannel or some other substance should be interposed between the limb and the sheet, band, or strap, with which the extension is to be made, so that the part may not be chafed or injured by the pressure.\*

\* See NOTE Y.



For making the extension, Sir Astley Cooper prefers pulleys, and, when the reduction is attended with difficulty, no one can doubt their advantage. The following are the principal directions, which he gives for the reduction of the dislocation upwards and backwards. The patient may be placed between two strong posts, about ten feet from each other, in which two staples are fixed; or rings may be screwed into the floor, and the patient be placed upon it. If two convenient posts for the staples can be found, the patient is to be put upon his back on an intermediate table, over which a thick blanket is spread. Then a strong girt is to be passed between his pudendum and thigh, and fixed to the staple behind the patient's head. Just above the knee, a wet linen roller is then tightly applied, over which a leather strap is buckled, having two other straps with rings at right angles with the circular part. The knee is to be slightly bent, but not quite to a right angle, and brought across the other thigh a little above the knee.\* The pulleys are then to be attached to the other staple, and to the strap above the knee. The surgeon is now slightly to draw the cord of the pulley, and when he sees that every part of the bandage is upon the stretch, and the patient begins to complain, he is to wait a little, and allow the muscles to become fatigued. He is then to draw again, and having thus increased the extension a little more, he is not to pull the cord further, but wait a short time again, in order to let the muscles yield. He is to proceed in this gentle and gradual manner, until the head of the bone is felt descending. When it reaches the head of the acetabulum, he is to desire an assistant to take hold of the cord of the pulley, and keep up exactly the same degree of extension, while he himself is now to rotate the knee and foot gently outwards, and, as this is done, the bone slips into its place. In the foregoing method, the return of the head of the bone into the acetabulum does not generally cause any noise, the muscles being too much fatigued to produce this effect. When there is difficulty in getting the head of the femur over the brim of the acetabulum, the former is to be lifted up by placing the arm under it near the joint.†

The dislocation upwards and backwards cannot be conveniently reduced, while the patient lies upon the opposite side, because this position interferes with the extension made across the other limb.

When the thigh-bone is dislocated forwards and downwards upon the obturator foramen, the reduction may be performed

\* In reducing a luxation upwards and backwards, Boyer says, "L'extension sera faite obliquement de dehors en dedans, et un peu de derriere en devant." Tom. iv. p. 301.

† A. Cooper, *Surgical Essays*, part i. p. 31.



while the patient lies either upon his back, or his sound side, and one chief object is to make a lever of the bone itself. A sheet, or table-cloth, longitudinally folded, is placed under the bone a little way below the trochanters, and being properly drawn towards the outside of the limb by an assistant, after due extension has been made, it serves as a fulcrum, on which the head of the bone may be moved into the acetabulum. Extension is to be made with the thigh at a right angle, or inclined somewhat less than a right angle to the trunk of the body;\* then, while an assistant draws towards the hip the sheet placed a little below the trochanters, the surgeon is to make a lever of the bone, by moving the condyles of the bone towards the other knee, or the ankle of the dislocated limb towards the other foot.

In general, nothing can be more simple and easy, than the reduction of a dislocation upon the obturator foramen. If the case be recent, the head of the bone may sometimes be replaced, as Sir A. Cooper has explained, by merely putting the patient in the recumbent posture, separating the thighs as widely as possible, and fixing the pelvis with a girt between the scrotum and upper part of the thigh, after which the bone will slip into its socket, if the surgeon move the ankle of the dislocated limb over the opposite leg. "In this case, the patient might have the thigh fixed by the bed-post,† received between the pudendum and the upper part of the limb, and the leg be carried inwards across the other. But, in general, it is required to fix the pelvis by a girt passed around it, and crossed under that which passes around the thigh, otherwise the pelvis moves in the same direction with the head of the bone."‡ And, in those cases, in which the dislocation has existed for three or four weeks, Sir A. Cooper thinks it best to place the patient on the opposite side, fix the pelvis, and make a lever of the bone, much in the same way as I have already described. "Great care (he says) must be taken, not to advance the leg in any considerable degree, otherwise the head of the thigh-bone will be forced behind the acetabulum into the ischiatic notch, from whence it cannot be afterwards reduced."

With respect to the dislocation upwards and inwards upon the os pubis, it is generally very easy of reduction. Accord-

\* Hey's Practical Obs. in Surgery, p. 319, ed. 2. Boyer directs the extension to be made obliquely from within outwards. The head of the thigh-bone being already lower than the acetabulum, it is plain, that extension, made in a line corresponding to the axis of the body, must tend to increase the displacement.

† As practised by the late Mr. Hey. See his Practical Observations in Surgery, p. 321, ed. 2.

‡ Surgical Essays, part i. p. 39.

ing to Boyer, the extension should be made in a direction nearly parallel to the axis of the trunk. Sir Astley Cooper recommends the patient to be laid upon his side on a table, and a girt, which is to be applied between the pudendum and inner part of the thigh, is to be fixed to a staple, a little before the line of the body. The pulleys are to be fixed just above the knee, as in the dislocation upwards, and the extension is to be made in a line behind the axis of the trunk, the thigh-bone being drawn backwards. The extension having been continued for some time, an assistant is now to press on the pelvis, while with a napkin, laid under the upper part of the thigh, the head of the femur is to be lifted over the pubes and edge of the acetabulum.\*

#### DISLOCATIONS OF THE PATELLA.

The generality of writers on surgery speak of luxations of the knee-pan in four directions, viz. upwards, downwards, outwards, and inwards; but, in the first two examples, the displacement of the bone is merely a consequence of another accident, namely, the rupture either of the tendon of the extensor muscles of the leg, or of the ligamentum patellæ.† According to many authors,‡ a dislocation of the patella inwards, happens more readily, than that outwards. Mr. C. Bell§ says, this bone is most frequently displaced inwards, owing to the lesser elevation of the inner condyle. Before the publication of the early editions both of the Dictionary and of this work, I had seen several cases of dislocation of the patella outwards, but never a displacement inwards, and I had therefore no hesitation in believing, that the first case is by far the most frequent. The difference of my account from that given by Mr. C. Bell, however, has attracted the notice of Mr. Dunn, of Scarborough, who remarks, in a letter written to me some time back, that, “on examining the bone (the femur) I should have been led to form your conclusion, owing to the greater magnitude of the inner condyle; but, on looking at the anterior and articular surface of the femur, I find, that the elevation is certainly less, and as such, I should conjecture, displacement inwards would

\* A. Cooper, in *Surgical Essays*, part i. p. 46.

† Writers also speak of cases, in which the patella is placed with one of its edges perpendicularly in the articular pulley of the femur, though there is some difficulty in conceiving, how the tendon of the extensor muscles of the leg, and the ligamentum patellæ, can yield sufficiently to allow this rotation of the bone, much less that in which its front surface is turned completely backwards. Boyer, t. iv. p. 350.

‡ “Patella interdum in interiorem, rarius in exteriorem partem ab injuria quadam externa e sede naturali propelli potest.” Callisen, *Systema Chir. Hodiernæ*, vol. ii. p. 592. 8vo. Hafniæ, 1800.

§ *Operative Surgery*, vol. ii. p. 279.

be more easily produced." The anatomical fact, the lesser elevation of the inner condyle, is the circumstance, that has led writers into a mistake on this point. The opinion, founded on this consideration, Boyer observes, is refuted by experience, which proves the greater frequency of the dislocation outwards; and no doubt, says he, this is owing to the inner edge of the patella projecting more than the external, so as to pass considerably beyond the articular pulley of the femur, and, consequently, be more exposed to such force as is calculated to propel it outwards.\* The ample experience of Sir Astley Cooper also confirms the fact of the greater frequency of the displacement of the patella outwards, though his description of the mode in which the accident is usually produced, is different from that of some other eminent surgeons: he observes, that the most frequent cause of the accident is from a person, in walking, or running, falling with the knee turned inwards, when the action of the muscles, in the effort to prevent the fall, draws the patella over the external condyle of the os femoris. The displacement, he says, generally occurs in persons who have some inclination of the knees inwards, which deformity disposes the patella to slip outwards during the action of the extensor muscles of the leg.† According to Boyer, both the dislocation outwards and that inwards are mostly caused by some external force, which propels the knee-pan in one of these directions; but, says he, great relaxation of the ligamentum patellæ, and a particular conformation of the condyles of the femur, may cause such a disposition to the accident, that the bone may slip out of its situation, without any outward force, from the mere contraction of the muscles. A girl came to Sir Astley Cooper's house, who had the power of throwing her patella off the condyles of the femur. Her knees were bent considerably inwards, and when the rectus muscle acted upon the patella, this bone was drawn from its natural situation into a line with the tubercle of the tibia, and laid nearly flat upon the side of the external condyle of the thigh-bone. She had been brought up as a dancing girl.‡ The same practitioner

\* *Traité des Maladies Chir.* t. iv. p. 349.

† *Surgical Essays*, part ii. p. 57. This gentleman, in the first part of his work, relates some cases of luxation outwards from relaxation of the ligamentum patellæ; but has not specified any example of luxation inwards, either in his first or second volume. The several instances reported by Valentin, Ravaton, Itard, and Boyer, were all outwards. I conclude, therefore, that the dislocation inwards is uncommon.

‡ Examples of a similar nature are mentioned by Itard (*Journ. de Méd. de MM. Corvisart, Leroux, &c.* t. i. p. 516,) and by Boyer. The latter author considers this tendency to spontaneous luxations of the patella outwards, always owing to a defective shape of the articular surface, combined with a lax state of the ligamentum patellæ.



also details cases, in which the ligament of the patella was so considerably relaxed, after an accumulation of fluid in the knee-joint, that the bone was subject to displacement, from the simple action of the extensor muscles of the leg.\*

When the knee is considerably bent, a luxation of the patella cannot happen, because the tendon of the extensor muscles and the ligamentum patellæ, keep this bone too firmly lodged in the depression between the condyles of the femur, for any displacement to happen from external violence. But, if the leg be extended, or the knee only slightly bent, the connexions of the patella are relaxed, it becomes more prominent, and its mobility is so much increased, that it is liable to be displaced, either outwards or inwards, according to the direction of the striking force.†

In the dislocation outwards, which is the most common, Boyer differs from some other writers, in representing the displacement as seldom complete, because the force which is applied, is rarely great enough to push the bone entirely off the articular pulley of the femur. In this circumstance, says he, the patella does not remain, as might be imagined, in its natural transverse position; but its anterior surface is turned a little inwards, and its posterior surface in a similar degree outwards, its inner edge inclining backwards, and lodging in the articular pulley itself, while its outer edge is turned somewhat forward.

The accident is attended with the following symptoms: the leg is extended,‡ and cannot be bent without seriously increasing the pain, which the patient already suffers; the inner margin of the articular pulley, off which the patella has slipped, can be plainly felt under the skin; over the outer part of the same pulley, the patella itself forms a remarkable swelling, and the outer edge of this bone is quite perceptible. Were the luxation complete, the extended position of the leg, the depression in the natural situation of the bone, the facility of distinguishing the articular pulley, and the tumour caused by the luxated bone itself upon the side of the outer condyle, would leave no chance of mistaking the nature of the accident.

A dislocation inwards may happen, when an external force propels the outer edge of the patella in this direction; but, the case is hardly ever complete.§ The patella forms a considerable prominence upon the internal condyle; its front surface is inclined outwards, and its posterior one inwards; while its outer

\* Surgical Essays, part i. p. 8.

† Boyer, *Traité des Maladies Chir.* t. iv. p. 350.

‡ See NOTE Z.

§ "On n'a point observé un semblable déplacement de la rotule vers le côté interne du genou." Delpech, *Precis Elem.* t. iii. p. 126.



edge is turned backwards, and its inner one forwards. In the depression observable in the situation from which the patella is removed, the outer condyle may be plainly felt with the finger. The leg is extended, and an attempt to bend the knee produces a great increase of pain. Were the luxation inwards complete, the case would be sufficiently manifest, by the depression in the natural place of the patella, and the extraordinary prominence occasioned in its new situation.\*

Dislocations of the patella are not generally attended with risk of serious consequences, and when the extensor muscles of the leg are completely relaxed, and sufficient pressure is employed, the reduction is perfectly easy.† However, if the violence applied should have been very great, the injury done to the ligaments of the joint may be far more dangerous, than the mere displacement of the patella itself. Boyer says, that he has never known of any case, in which a dislocated patella was left unreduced, and, therefore, he cannot pretend to describe the exact state in which the patient would be likely to be; though he conceives, that the flexion of the knee would be imperfect, and the joint weakened. Mr. Dunn, of Scarborough, to whom I feel indebted for several valuable communications, gave me an account “of a person at Pickering, who, from an oversight of the surgeon, has had a dislocation of the patella outwards for twenty years. The anterior part of the knee is soft, and filled with a fluid, (lately requiring blistering to keep it down.) The patella lies on the outside, and back of the external condyle of the femur. When he walks, he has a short stick to assist him. The limb seems to be raised by the flexors alone. As his knee is slightly bent, he rests upon his toes, and performs a sort of skipping, or jerking motion. He cannot raise his leg while sitting.”

From what has already been said, it is evident, that in some cases, merely extending the leg without bending the thigh at all on the pelvis, will not enable the surgeon to reduce a dislocated patella. Hence, the practice, inculcated both by Boyer and Sir Astley Cooper, is the same as that particularly recommended

\* Boyer, *Traité des Mal. Chir.* t. iv. p. 351.

† A case attended with some trouble, occurred in Mr. G. Young's practice, and is described by Sir Astley Cooper, *Surgical Essays*, part ii. p. 58. An instance of similar difficulty is also recorded by Valentin. (See *Recherches Critiques sur la Chirurgie Moderne*.) The difficulty in both cases, however, only proceeded from the limb not being at first sufficiently elevated, and, as soon as the heel was raised up high enough to bend the thigh on the pelvis, as well as extend the leg, the patella was readily pushed back into its natural situation. Sabatier once appears to have failed to accomplish the reduction of a dislocation outwards, which Boyer afterwards rectified by attending to the perfect relaxation of the extensor muscles of the leg. See Boyer's *Traité des Maladies Chir.* t. iv. p. 359.

by Valentin: the latter says, the patient should be placed in a recumbent posture, and an assistant is to raise the leg, by lifting it at the heel. The extensor muscles being thus fully relaxed, the surgeon is to press down that edge of the patella which is most remote from the joint, whether the luxation be outwards, or inwards. This pressure raises the inner edge of the bone over the condyle of the femur, and the patella is immediately drawn into its natural situation by the muscles.\*

After the reduction, the joint should be covered with linen kept wet with a cold evaporating lotion; and other antiphlogistic means employed. When the swelling abates, a bandage is to be applied. Should any disposition to relapse exist, in consequence of a relaxed state of the ligamentum patellæ, or the shape of the condyles of the femur, a laced knee-cap would be of service.

\* A. Cooper, Surgical Essays, part ii. p. 58.

# NOTES

BY A. H. STEVENS, M. D.

ONE OF THE SURGEONS OF THE NEW YORK HOSPITAL.

## NOTE A.

Page 15.

The following is the method recommended by Dr. Physick, for the extirpation of enlarged tonsils:—

“The double cannula I employ is about four inches long, with short arms soldered on the sides, near one end of the instrument, at right angles to it. Through the cannula I next pass a doubled iron wire, and fasten one of its extremities round one of the arms of the instrument, leaving the other free, and projecting five or six inches. This enables me to increase or diminish the size of the noose, formed by the doubling of the wire, at pleasure. The selection of a proper piece of wire, I consider of much importance. It should be tough and flexible, formed of soft pure iron, having firmness enough to allow it to be pushed backwards and forwards in the cannula without bending too easily, so that the noose may be enlarged or diminished. It should also have sufficient firmness to allow of a little lateral pressure, otherwise the noose cannot be pressed down so certainly on the base of the tumour. The wire I use is about one twenty-fourth of an inch in diameter, or perhaps less.

“It is moreover necessary to be provided with a pair of flat pliers, to take hold of and move the wire conveniently. These instruments being prepared, the noose formed by the doubling of the wire, projecting beyond the end of the instrument, is made large enough to pass easily over the enlarged tonsil, and should be bent a little to one side, in order that it may be more easily pressed down on the base of the tumour.

“The patient is to be seated opposite a window, and his tongue must be held down by an assistant with the handle of a large spoon, or with a spatula. The surgeon is then to slip the noose over the tonsil, and down to its base, taking care not to include the uvula, which, when the swelling is large, is apt to be in the way. The wire is then to be drawn sufficiently to fix it loosely on the part, and the surgeon is to satisfy himself, by an attentive inspection, that it is properly applied. This being accomplished, the wire is to be taken hold of with the pliers, and drawn through one side of the cannula, so as to secure it at once on the base of the tonsil as firmly as possible, and then to fasten it on the arm of the instrument, and thereby prevent all entrance of fresh blood into the tumour. This method of stopping the circulation of blood in the swelling, necessarily occasions severe pain at the moment; but the severity of it soon ceases.

"On examining the tonsil, after a few minutes, its colour will be observed to be changed to a deep purple, or almost black, and its surface smooth and polished, owing to the exterior membrane being stretched.

"It has hitherto been my custom to allow the instrument to remain thus applied twenty-four hours, with the view of destroying completely the life of the enlarged gland. I am, however, of opinion, that a much shorter time would be sufficient, as eight or twelve hours, which I propose soon to ascertain. After having destroyed the life of the swelling, by the above means, the next step of the operation is the removal of the instrument, which is easily accomplished in the following manner: Take a firm hold of the end of the cannula projecting from the mouth, then disengage the wire on one side from the arm of the instrument, straighten it, and with the pliers push a small portion of it back through the cannula, and repeat this until the noose is so much enlarged as to slip off the tonsil. The operation is now completed; the tumour appears shrivelled and of a dull white colour; the patient suffers no pain; the inflammation is moderated, and, after a few days, the dead parts are separated and thrown off, either entire or in fragments, which are sometimes spit out, sometimes swallowed."—*Physick, in Med. and Phys. Journal of Philadelphia, No. 1.*

I have employed indifferently a single or a double cannula, such as is described by Dr. Physick, and a fine annealed silver wire. This I have placed around the tonsil, by drawing it from behind the velum pendulum with a double tenaculum, the noose being passed over the handle. If the wire be drawn very tight at first, it will not often require to be tightened a second time. I have generally left the wire to fall off of itself, which usually happens from the fifth to the seventh day; and I apprehend, that it is particularly necessary to draw the wire very tight where it is intended to pursue the plan of Dr. Physick. I have failed in attempting it, owing perhaps to not attending to this or some other circumstance, I could not explain.

Sir Astley Cooper recommends a different method in his *Surgical Lectures*. A double thread is to be carried through the centre of the basis of the tonsil by means of a tonsil needle, and one ligature is to be tied above and the other below, so that each shall include half of the basis. The ligature should be cut in less than a week. The operation produces considerable irritation by the nausea and cough which it excites, but afterwards the child goes about playing, and is very little affected by it. One application of the ligatures will generally do, but if ulceration goes on very slowly, a second should be made. There is no danger in cutting through the tonsil gland, unless you cut through its base; but the large vessels, given off by the carotid, are very near the base of the gland.

## NOTE B.

### Page 109.

In a case of strangulated hernia, when, after the operation of dividing the stricture was performed, and there was a difference of opinion among the surgeons present as to the propriety of returning the intestine, by reason of its being mortified or nearly so, Dr. Hewson informs me, it was agreed to envelope the intestine in cloths, wrung out of warm water, and wait the result. In about an hour it was again examined, and having improved in appearance, it was accordingly returned. This plan appears to me highly ingenious and worthy of imitation.



## NOTE C.

Page 117.

*Of the treatment after an operation for hernia.*

The edges of the wound having been approximated, and retained by a suture passed through the integuments only, and covered with adhesive plaster, and the patient being taken carefully to bed, the surgeon is never to leave his patient until he has two or three evacuations from his bowels, and he should, on no account, be permitted to rise, or to exert himself, for any purpose whatsoever. If, in two or three hours, alvine evacuations do not occur spontaneously, it will be proper to give some sulphate of magnesia, or other purgative. Patients will, in general, recover more quickly in proportion to the number of the evacuations; and if no purgatives are given, there will be danger that the part, which has been strictured, may run into gangrene in a few hours; or, in less severe cases, that the inflammation will extend to the peritonæum. Purgatives should, therefore, be administered freely, soon after the operation, and repeated on the second and third day. If the abdomen become tense and painful, and there is a difficulty in procuring evacuations, one or more bleedings, from the arm, will be proper, notwithstanding the apparent smallness of the pulse, and general debility. It is never too late to bleed in these cases, until the pulse intermits and the pain ceases.

## NOTE D.

Page 148.

The tumour in hydrocele is accurately circumscribed towards the ring, so that, by drawing the tumour down, the thumb and forefinger can be introduced between it and the ring: and this circumstance, more than any other, is the foundation of our diagnosis.

## NOTE E.

Page 177.

This is at variance with the result of my own experience, which accords entirely with that of Mr. Ramsden. Of the common enlargements of the testicle, arising from chronic inflammation, by far the greater number that I have met with, in hospital and private practice, have been connected with, and, as I judge, dependent upon, stricture, or an irritable state of the urethra, and have pretty uniformly yielded to the introduction of bougies.

## NOTE F.

Page 178.

The removal of the fungus with the knife is recommended by Mr. A. Cooper. I have generally included the diseased edges of the scrotum also, between two semi-elliptical incisions. Although the testicle is of no use, patients are much better satisfied to have it left.

## NOTE G.

Page 200.

“Besides the rules of treatment proper to all inflammatory affections of the testicles, arising from whatever cause, there are some peculiar to that which arises from a suppression of the gonorrhœal discharge. In this case we should endeavour to restore the suppressed secretion, by exposing the parts to the vapour of hot water; covering them with emollient poultices;

and, if these do not bring on a discharge, by irritating the termination of the urethra with the point of a bougie. Care must be taken not to push the bougie far into the urethra, for the irritation it would occasion to the veru montanum would increase the inflammation it was intended to relieve." —*Richerand, Nos. Chirurg. tom. iv. p. 280.*

## NOTE H.

Page 233.

The present gate-keeper of the New York Hospital applied for advice about three years ago, with an excrescence behind the glans penis, and a stony hardness of the body of that organ. There was a difference of opinion among the surgeons as to the cancerous nature of the complaint. It was, however, amputated. Some months afterwards, one of the glands in the groin became enlarged and hardened, but not painful. It was removed. The man returned some months afterwards with an ulceration of the glands in the other groin. The integuments were ulcerated to the extent of an inch square, and there were cribriform holes through the skin; but the edges of the sore were not everted, the granulations were healthy in appearance, and there was no pain. The diseased parts were removed, and the man has since continued well. This case would seem to prove, that glandular affections, even going on to ulceration, may arise from remote diseased irritation: neither cancerous nor venereal, nor of any specific kind.

## NOTE I.

Page 239.

The best tourniquet is the finger and thumb of an assistant, applied in such a way as to pinch the skin of the penis, and compress the corpora cavernosa near the root of that organ.

## NOTE K.

Page 239.

Undoubtedly all the arteries should be tied that can be found; but the most troublesome hemorrhage is an oozing from the divided corpora cavernosa. The best method of arresting this is, to pass two ligatures through four opposite points of the ligamentous sheath of the corpora cavernosa, and tie them over lint laid on the bleeding surface. Of course, a short cannula must be previously introduced into the urethra.

## NOTE L.

Page 267.

To find the opening into the urethra, constitutes the chief difficulty of the operation. When the methods recommended by the author do not succeed, a catgut bougie may be introduced per urethram, and, in many instances, the end of it coming through the false passage, will be directed into the fistula: it will then serve to guide the knife. Should this fail, introduce a hollow bougie of gum elastic, with a small hole cut in the side of it about two inches from the extremity, and inject a coloured fluid through it. The escape of this into the sinus may enable the surgeon to discover the ulcerated portion of the urethra.

In a very troublesome case of fistula in perinæo, in which the patient at sea had extensively lacerated the urethra, I found it impracticable, after repeated trials, to direct the catheter into the bladder along the whole

course of the urethra, though I could easily pass a female catheter into the bladder by the opening I had made in the perinæum. I had an instrument constructed like the half of a female silver catheter divided longitudinally, and passing this into the bladder, by the perinæum, I found no difficulty in causing a catheter, introduced through the meatus urinarius, to glide along its concave surface into the bladder.

Fistulous communications, between the bladder and rectum, do not always open externally. The following case, by Mr. A. Cooper, shows what is proper to be done in such cases:

"A gentleman came to London under the following circumstances: He had an abscess formed upon the anterior and lateral part of the rectum, which had discharged itself, after long-continued suffering, into the rectum, just above the verge of the anus. The surgeon whom he consulted in London, discovering the aperture, divided the sinus, and he returned into the country; but the wound did not heal, and a considerable discharge proceeded from it. Observing the discharge with attention, he found that, after making water, the urine passed through the aperture, and that, consequently, there was some communication between the urethra and rectum. Alarmed at this circumstance, he came to London and placed himself under my care. I examined his urethra, and finding some obstruction at the apex of the prostate gland, advised him to make use of large metallic bougies, until the natural diameter of the urethra, at that part, had been re-established, hoping that, in this way, the opening would be disposed to heal as the urine found a more ready course than through its natural channel. He persevered in the use of these instruments for several weeks, but with no apparent advantage, as the urine still passed by the fistulous aperture. I therefore advised the introduction of a metallic catheter of large size into the urethra, and, to give it full effect, recommended that he should steadily observe the recumbent posture, which he did for a month; during which period the urine did not pass by the rectum: but as soon as the instrument was withdrawn, the urine resumed its former unnatural course. He returned into the country greatly disappointed; and, after remaining there for some time, and finding his complaint increased, he again applied to me, and I advised him to undergo the following operation for his relief: I introduced a catheter into his bladder, and my finger into the rectum, and then made an incision, as in the operation for the stone, in the left side of the raphe, until I felt the staff through the bulb. I then directed a double-edged knife across the perinæum, between the prostate gland and rectum, intending thus to divide the fistulous communication between the urethra and the bowel. A piece of lint was introduced into the wound, and a poultice was applied over it. When the lint was removed, the urine was found to take its course through the opening in perinæo; the aperture in the rectum gradually healed, and that of the perinæum quickly closed; after which the urine took its natural course. Whilst the wound, which I had made, was healing, one of the testicles became enlarged and inflamed, as I supposed from the irritation on the extremity of the vas deferens, or in sympathy with an irritated vesicula seminalis on that side. This inflammation left some hardness of the epididymis, but no further inconvenience, and the urine has never since deviated from its natural channels."—*Cooper and Travers's Surgical Essays*, part 2, p. 124, *et sequent.*

## NOTE M.

Page 286.

"This occurrence [incontinence of urine] never takes place but when the boy is asleep upon his back; and the cure is a very simple one: he is

to accustom himself to sleep upon his face or side: the urine is not passed, nor is he excited to dream of making urine while he keeps this position. The circumstance is unaccountable until we reflect on the position of this mainspring, (the sinus pocularis or lacuna in the posterior part of the urethra at the beginning of the caput gallinaginis) the sensible spot a little behind or below the orifice of the bladder. When the person lies upon his belly, the urine gravitates towards the fundus; but when he lies on his back, it presses upon this sensible spot, and distends that part of the bladder which is towards the rectum."—*Charles Bell and M. Shaw on the Urinous Organs*, p. 18.

## NOTE N.

Page 292.

Children are not unfrequently born in this manner, and now and then a portion of intestine is wanting. The jejunum I have seen terminating in a blind extremity, and the ileum beginning also in a blind extremity, some distance from it. In this state, children generally live for eight or ten days, vomiting, however, whatever they take; sometimes they live for a considerable period. When the intestine is imperforate near to the pylorus, the secretion of the kidneys does not go on. This is a fact, which, in a physiological point of view, is very interesting, as it proves the fallacy of the doctrine that fluids can find a passage into the bladder, when the kidneys are obstructed. It appears, also, that absorption does not go on in the stomach. A person asked Mr. Cooper to see a child who had passed no urine since its birth. He passed a small catheter, and drew off very little more than a small tea-spoonful. In seven or eight days it died, and, on examination, the kidneys were found perfectly formed and healthy; but the stomach was shut at the pylorus, and the intestine was wanting for some distance, and the duodenum began in a blind extremity. The child sucked freely, but soon after threw up what it had taken into the stomach. Absorption, therefore, does not take place in the stomach as in the smaller intestines.

An imperforate intestine is very frequently found at the anus. Sometimes there is a slight appearance of intestine: now and then there is no appearance at the anus whatever.

In these cases, the child may not unfrequently be relieved. When the intestine is situated just above the anus, you may sometimes restore the patient to a complete state of health; if higher, you cannot. If the intestine ends above the part where the muscles which move the anus are situated, they are not formed; but if the rectum ends close to the anus, then the muscles are formed, and the child may be perfectly restored. If the child has not had a passage of the meconium since its birth, pass your finger to where the anus should be, and make the child cry: if the intestine is there, the action of the abdominal muscles and diaphragm presses it against your finger; but if it is at a considerable distance, you do not feel it. Thus you judge of the probability of success from the performance of an operation. Feeling the intestine project against your finger, you make an opening with a lancet, the edge of which is directed towards the os coccygis, and directly the air and meconium rush by the side of the instrument. A metallic tube should be introduced to allow a more free discharge. It is better to use a lancet than a trocar, for in introducing the latter, it is liable to pass between the coats of the intestines, and make an opening in the canal higher up than is necessary. Mr. A. Cooper knew a child who died from this cause. The feces were extravasated a considerable distance above the anus. The tube should be worn and increased in size, and sometimes it should be worn for years. Its length should be



according to the deficiency, and as large as the child is able to bear. It should be removed from time to time, for the purpose of cleaning it; where a plug is worn, it soon becomes filthy and offensive. Where the muscles, about the anus, are formed, the child soon becomes restored; but where they are incomplete, it takes a very great length of time.

## NOTE O.

Page 293.

The causes of fistula in ano are most generally obstructions in the viscera of the abdomen, which they often relieve.

It is not uncommon to find several *external* openings; but there is rarely more than one *internal* orifice. This is usually very near the anus, in the cavity between the two sphincters, and below the internal sphincter, of which the repeated contractions produce a considerable elevation, or something like a stricture of the rectum. The internal opening is sometimes too high to be reached by bougies. The examination must be made with great care, or the openings, concealed in the wrinkles of the anus, will often escape notice.

A small probe, introduced into the opening, is sometimes prevented from following the course of the fistula, by reason of its narrowness and crookedness. If, by bending the probe and pushing it gently in various directions, it do not pass onward, the fistula should be distended by injecting cold water. An examination is always rendered easier by an empty state of the bladder and rectum. When the probe has pointed to the bottom of the fistula, the finger is to be introduced into the rectum, to ascertain if it has entered the internal orifice. The internal opening may *sometimes* be felt by the finger alone. It feels like the anus of a chicken, an opening surrounded by hard elevated points. If there be more than one external opening, a probe must be passed simultaneously into each. When the fistula runs under the skin, for some distance before it rises by the side of the rectum, the skin must be slit open, before the fistula can be properly explored. We should never pronounce that there is no internal orifice, until we have made repeated and very careful examination in different positions of the patient.

Fistula in ano is often a constitutional disease, and to cure it will occasion dropsy, hepatitis, phthisis pulmonalis, or apoplexy. A patient of Heister was seized with gout whenever his fistula ceased running. Richter mentions a case of blindness following the operation. A medical gentleman of this city has had dropsy of the knee-joint several times, in consequence of his fistula ceasing to run, and he has often relieved it by introducing a segar, and provoking a discharge.

The French operate with a straight strong sharp bistouri, a grooved director, and a gorget. The gorget is introduced into the rectum, and given to an assistant; the director is then introduced into the fistulous opening, and made to rest upon the gorget. The bistouri is introduced with its back next the groove of the director, and the incision completed. M. Larrey has contrived a flexible probe, with a blunt point at one end, and a groove and handle at the other. This is used with a gorget, having a hole to receive the blunt end of the probe.

As the intestine is often denuded above the internal opening, it should be divided after the fistula is laid open, and this operation is, I think, best done with a pair of blunt scissors, as recommended by Wiseman.

If fistula in perinæo exist at the same time with fistula in ano, it must be first attended to, and the fistula in ano afterwards. If any of the neighbouring bones be carious, they must be cured before the operation is attempted.

One of the most fearful accidents, after cutting a fistula, is hemorrhage; especially when the incision reaches above the internal sphincter. When the internal sphincter is divided, the blood accumulates in the intestine; the patient becomes pale and faint, is affected with colic and bearing down pain, goes to the chamber, and often fills it with blood! Injections of cold water will sometimes arrest the bleeding. A ligature may often be applied; but neither of these means offer a certain resource, like the following:—Cover the anus with a piece of oiled silk, or a bladder, or a silk handkerchief, push the middle of it up the rectum, fill the cavity with lint or sponge, draw down the corners, and put on a T bandage. When the internal sphincter has not been cut, the blood flows outwardly, and the sphincter itself affords sufficient resistance to allow the vessel to be compressed simply with lint.

The object of the dressing is, to prevent the incision from healing before the fistula. Between the edges of the incision, we should, therefore, introduce a small quantity of lint; or, what is equally efficacious and less painful, a strip of linen covered with cerate. It is not necessary to cover the surface of the fistula with lint, or any other dressing. Obstinate diarrhœa, retention of urine, and violent tenesmus, are frequently occasioned by improperly cramming the fistula with dressings, the removal of which commonly relieves them. If, however, such symptoms depend upon inflammation of the parts, the application of a poultice is the best remedy.

Foubert, Sabatier, and more recently M. Larrey, deny the existence of external incomplete fistula. The latter avers, that fistula always commences from the rectum, and proceeds outward, and never the reverse, unless in cases of wounds, or an external ulcer spreading to the rectum. "All the success of the operation, therefore, depends upon finding the internal orifice; and the reason that fistulas so often return, is, that instead of finding the internal orifice, surgeons either accidentally or purposely make an artificial opening into the gut."

## NOTE P.

Page 297.

Baron Boyer has recently called the attention of surgeons to what he has denominated fissure of the anus. Though this disease was noticed by *Ætius*, (*Tetrab. iv. chap. 3.*) it passed unobserved by modern surgeons, until the time of Sabatier, who imperfectly described it. Baron Boyer has met with many cases of it, and it is now understood by all the surgeons of Paris, where it is said to be not uncommon. It has been generally confounded with ulcerated piles, blind fistula, or other disease of the rectum. The symptoms it occasions have been considered inexplicable by the surgeon, though exceedingly distressing to the patient.

Fissure of the anus is an oblong ulceration of the extremity of the rectum, just where the mucus membrane joins the skin. The ulceration is generally a little above the anus, so that it is not easily discovered, unless the sides of the rectum are drawn outwards, and the gut partially everted. Moreover, the fissure is superficial, and presents nothing striking to the eye, and is, therefore, more likely to pass unobserved. The mucus membrane is more red than natural at the edges of the ulcerated portion, which is entirely absorbed; but there is nothing unnatural to be felt with the fingers, except a very remarkable constriction, which accompanies, or rather precedes, this disease. It would appear, that this constriction is, indeed, the cause of the malady, which results from the efforts to expel hardened feces through the contracted passage. The introduction of the finger causes exquisite pain.

The first symptom of the disease, is pain felt in evacuating the rectum, greatly aggravated by costiveness, and rendered most excruciating by the hardness of the feces. Hence the sufferer is led to use injections and mild laxative medicines. In the commencement, the pain subsides at the expiration of about half an hour; in its progress, the paroxysms lengthen to several hours duration, and the patients writhe in agony, not knowing what position to put themselves in. They suffer least in bed, and remain there several days without leaving it. The pain has accessions, without any known cause, and often ceases in the same manner.

The pain appears to be owing to a retention of excrementitious matter near the extremity of the rectum, the expulsion of which is prevented by the constriction of the sphincter ani. The feces are, sometimes, streaked with a line of blood, especially if they be hard; but this is not always the case: sometimes there is a discharge per anum of a white liquid matter, in small quantities; this is what would be expected from an inflamed or ulcerated mucus membrane, but occasionally the ulceration extends to the muscular coat of the intestine.

These symptoms vary in different patients. In delicate and nervous women, a variety of remote symptoms occur, and often conceal the origin of the primary complaint, which is mistaken for cancer of the rectum, ulceration of the womb, &c.

In this disease, there are two distinct occurrences, viz.—constriction of the anus, and ulceration or fissure. The former is the cause of the latter. Ulceration without constriction, as we every day see in fistula in ano, does not occasion so severe pain as is felt in this complaint. With respect to the treatment of this complaint, if it be slight, it will sometimes yield to laxative medicines, and the application of leeches to the perinæum. But these means are not generally sufficient. It is then necessary to divide with the knife the whole of the sphincter ani, and that, if possible, immediately at the seat of the fissure. The incision should be at least one-third of an inch deep, especially near the verge of the anus, and an inch long. After the operation, or at any rate before cicatrization begins, a tent is to be introduced and kept in the rectum, without which the operation would be unsuccessful. When the fissure is in the anterior part of the anus, as the sphincter could not be safely divided in that direction, it is best to cut towards the coccyx. After the cure, the anus is found more ample than before.

*See Journal Complimentaire du Dict. des Sciences Med. et Dict. des Sciences Medicales, art. Fistule.*

## NOTE Q.

Page 314.

Dr. Physick's gorget, which is generally employed in the United States, is preferable to any other, being free from the objections pointed out by the author, and being susceptible of receiving a much keener edge near the point.

It has been urged, that the blades are too broad, and that they endanger the cutting of what has been called the prostate fascia, or the partition between the pelvis and the abdomen. Such fears can only arise from mistaken ideas of the anatomy of the parts. The subject is discussed in a paper published by myself in the sixth vol. of the Medical Repository, and in the Medical Recorder by Mr. Anderson, who assisted me in the dissection. The fascia iliaca above the foramen thyroideum, sends off an aponeurosis, which invests the fundus of the bladder, and another which covers the whole of the prostate.



## NOTE R.

Page 315.

I have always withdrawn both the sound and the gorget immediately after making the incision with the latter; nor have I ever found any difficulty in introducing the forceps without any other guide than the forefinger of the left hand. The point of the forceps should be directed a little upwards, to avoid a little pouch formed by the receding of the loose cellular membrane between the prostate and the rectum.

## NOTE S.

Page 323.

I see no good reason for confining the knees, which, on the contrary, beside being exceedingly irksome to the patient, obstructs the free passage of urine through the wound, especially if there be much swelling, or a want of parallelism between the external and internal incisions, which I believe to be a great fault in any operation. The obstruction to the course of urine outwards, often causes it to be extravasated in the loose cellular texture behind the prostate. To obviate this occurrence, Dr. Physick recommends a gum elastic catheter to be introduced into the wound, immediately after the operation. If this plan be found to create less irritation than allowing the wound to remain somewhat open, by leaving the legs unconfined, it ought, undoubtedly, to be preferred.

Mr. Charles Bell's ideas on this subject, as expressed in the latter part of the following paragraph, seem to me entirely correct.—*Illustrations of the Great Operations of Surgery*, p. 129, *et seq.*

"It is generally believed, that no dressing, and no attention to the wound, are required, and that we should tie the knees of the patient together, and cover the wound with a bit of oiled lint. This is a very dangerous practice. I have lost a patient by this means, after an operation, rapid and successful in all besides. We ought to dress by introducing a piece of lint, spread with cerate, on each side of the lips of the wound, to the depth of an inch: we ought then to introduce a piece of lint, twisted and dipped in water, to the depth of the wound of the bladder. This should lie quite loose in the wound, not filling it up, and rather acting as a syphon. The twist of lint should be often withdrawn, and another gently insinuated; the more especially, if the urine does not drop freely from the wound, or come readily in a gush. If the patient feels an inclination to make water, and if there be an attempt to make water by the natural canal, it should be immediately prevented, by passing the finger into the wound, and making free the passage for the urine by the wound. We find it delivered, that the urine coming by the natural passage, the first and second day, is beneficial, and promises a speedy cure. Nothing can be more false and dangerous than this; for, if the urine come along the natural passage, it proves that there is a union of the sides of the wound by coagulated blood, or by means of inflammatory agglutination. Now this obstruction, by the wound, is more apt to send the urine into the cellular membrane, behind the fascia of the prostate, than forward into the urethra; and therefore the coming of the urine by the natural passage should be prevented, by securing perfect freedom for its exit by the wound. Either the assistant should watch by the patient, and take away the lint from time to time, to see that the urine is flowing, and to take care that he has no desire to make water, without immediate relief, and a free passage; or, an elastic gum tube should be passed into the bladder, to secure the free discharge of urine, during the three days succeeding the operation.



"Let the patient be laid on his back, and a small pillow put betwixt the knees, and a fillet round them. Tepid water should be occasionally injected by the urethra, during the cure."

## NOTE T.

Page 326.

Mr. Klein's advice is such as I should by no means be disposed to follow. To tie the internal pudic artery is not impracticable, nor, I apprehend, very difficult. If a tenaculum cannot be passed under the artery, by reason of its proximity to the bone, it may, at any rate, be passed so near it, that a ligature, put tightly round the flesh above the instrument, will effectually arrest the hemorrhagy. It is unfortunate that European writers should not know, that this plan was executed in this country, by Dr. Physick, more than twenty-five years since.

## NOTE U.

Page 327.

The following observations, on lithotomy in the female, are introduced here, not only because the author has omitted this subject altogether, but that the method practised by the celebrated M. Dubois is not to be met with, as far as I know, in any English publication.

Stone in the bladder, in the female, produces exceedingly severe pain at the orifice of the meatus urinarius, very frequent inclination to make water, and a discharge of blood, per urethram, after exercise. Besides these symptoms, which are common to the male, they suffer a most excruciating bearing down pain, as if all the parts of the pelvis were going to protrude, and after a very inconsiderable time, there is a total incontinence of urine.

Stones, weighing nearly an ounce, have been known to pass away through the urethra. I have removed one weighing nearly two ounces, of a flattened pyriform shape, which had entered the urethra, and remained impacted there, the fundus projecting down into the vagina. Part of the vagina and urethra were divided in the median line, by cutting upon the stone, which was then easily hooked out with the finger. The incontinence of urine continued about four weeks, after which the woman was perfectly restored.

In the common method of cutting for the stone, in the female, the patient is bound and placed in the usual position; an assistant holds asunder the labia, while the surgeon introduces into the urethra a grooved cannula, slightly curved; the groove being directed downwards, a blunt bistouri is passed along it into the bladder, and an incision is made outwards and downwards. The dangers of the operation are, on the one hand, the cutting of the vagina, by directing the incision too much downward; and, on the other hand, wounding the internal pudic artery, by making the incision too horizontal, and incontinence of urine is not an unfrequent consequence. Besides, it may happen, says M. Dupuytren, "that the fundus of the bladder, extended transversely on the sides of the neck, and adhering to the vagina, may be cut, while the surgeon is making the incision into the neck of the bladder." But, if these dangers are avoided, the extraction of the stone, which must necessarily distend the parts, will often caccrate the inferior part of the vagina in the direction of the incision, and this accident cannot be avoided, neither by making extensive the incision of the neck of the bladder and the urethra, nor by deepening the division of the adjacent parts. The opening must distend, and the vagina is often lacerated in this operation.

To avoid tearing the vagina, or dividing either that canal or the internal pudic artery, M. Dubois conceived the idea of cutting directly towards the symphysis pubis; and the only objection to this method, that he could imagine, was, the uncertainty whether the urethra, connected to the symphysis by a ligament and the anterior paries of the vagina, which is intimately united to the urethra, would yield in a direction backward, sufficiently for the extraction of a large calculus. M. Dubois's extensive experience has completely removed this imaginary difficulty, and the operation, after his method, is the most simple that can be imagined, and entirely free from danger. A director is merely introduced into the bladder, with its groove upward, and the urethra and neck of the bladder is slit *directly upward*.

See Dupuytren's "*These soutenue publiquement dans l'amphitheatre de la Faculté de Medecine de Paris.*"—Paris, 1812.

#### NOTE V.

Page 343.

"In the high amputation of the thigh and arm, we find advantage in tying the arteries, and removing the tourniquet, before sawing the bone. This enables us to retract the muscles more fully, and, consequently, to sink the bone deeper in the face of the stump."—*Op. cit.* p. 110.

#### NOTE W.

Page 353.

Mr. Cooper has not described the method of amputating at the wrist, an operation often called for, and one which succeeds very well.

It is well described by Mr. C. Bell.—*Op. cit.* p. 73.

"1st. Mark well the styloid processes of the ulna and the radius. Begin the incision so far beyond these, that they may be covered with the flap of the integuments; the incision should be semicircular; the extremities of the incision terminating half an inch before the processes of the bones. 2d. Dissect up the incision, so as to uncover the bones of the carpus. 3d. Divide the extensor tendons as high as possible. 4th. Then, bending the hand downwards, cut the capsular ligament, and round ligament of the ulna, that joins the carpus to the forearm. This almost severs the hand. 5th. Cut through the flexor tendons and integuments on the inside of the wrist at one cut, inclining the knife in such a manner as to leave the skin full over the ends of the radius and ulna. This operation, tedious in the description, is performed within the minute. Take up the two arteries, and bring the edges of the skin nicely together."

#### NOTE X.

Page 415.

Doctor M'Kenzie, of Baltimore, succeeded in reducing a dislocation of the humerus of nearly six months duration.

#### NOTE Y.

Page 431.

Doctor Physick prefers making the extension just below the knee, making use of the leg, both to rotate the femur and to regulate the extension; and this method appears to me to possess some advantages over both the others.

## NOTE Z.

Page 436.

In a case of complete luxation of the patella outwards, which recently happened in my presence, by a young lady's falling with her feet under her, I found the leg moderately flexed, and she had not the power of bending it so as to make the toe touch the ground. I reduced it with the greatest ease, merely by extending the leg, and pushing the patella inward.

# APPENDIX.

---

## ANCHYLOSIS.

Considerable attention has been excited to the subject of ankylosis, since the publication of a valuable paper by J. Rhea Barton, M. D., of Philadelphia, in the North American Medical and Surgical Journal, for April, 1827—to which work we are indebted for the following abridged history of a highly interesting case of ankylosis at the hip-joint, attended with very great deformity, which was effectually cured by an operation for the formation of an artificial joint; together with the peculiar views of Dr. B. respecting the surgical treatment of such cases.

John Coyle, ætat 21, sailor, states, “that on the 17th day of March, 1825, he fell from the hatchway into the ship’s hold, upon the end of a barrel, a distance of about six or seven feet; that the force of the fall was sustained on the outside of his right hip; violent pain was the immediate consequence, and much tumefaction ensued; that after the injury, he arose with difficulty, and attempted to walk; thinks he made one or two steps, but was compelled to retire to his hammock, where he laid contracted for the space of about eighteen days; was then taken into Porto Cavello, and conveyed to the hospital. When lodged upon his bed, he placed himself on his side, with the injured limb uppermost, drawing the thigh to a right angle with the axis of the pelvis, and the knee resting on the sound side. In this posture he continued, without any material alteration, for the space of about five months; in the mean time, enduring all the suffering attendant upon a high degree of inflammation of one of the largest joints in the human body, and unalleviated by the support of splints, or a judicious antiphlogistic course of treatment. As might naturally be expected, a rigid and deformed limb was the result of such disease, combated only by the administration of some simple liniment.” With regard to the real nature of the primary injury, little could be ascertained. By some of the surgeons who saw him, it was believed to be a dislocation, by others, a fracture.

In October, 1825, Coyle returned to Philadelphia, and “early on his arrival,” says Dr. B., “he exhibited himself to me. He was then supported by crutches, having the thigh drawn up nearly to a right angle with the axis of the pelvis, and the knee turned inward, and projecting over the sound thigh; so that the outside of the foot presented forward. There was considerable enlargement round the hip, which so much obscured the case, even at this date, as to prevent me from forming any positive opinion as to the real nature of the original injury. From the fixed and immovable condition of the limb, it was impossible to ascertain, whether, in a straight position, there would be shortening, and, if any, to what extent. The general feature of the limb bore *somewhat* the resemblance of that resulting from a dislocation into the ischiatic notch; yet the position in which the great trochanter stood, in relation to the superior anterior spinous process,



discouraged such a belief. All things considered, I was rather inclined to the opinion, that there had been neither fracture nor luxation; but that the violence of the fall had produced an extensive contusion of the round ligament and joint, and that disorganization had followed the consequent inflammation. On this point, whatever might have been the nature of the accident, I thought I might feel assured, that *now* all articular movement was gone, and that true ankylosis had taken place. Trusting, however, to the fallibility of my judgment, and wishing, for the patient's sake, that it might prove erroneous, I was induced to admit him into the Pennsylvania Hospital, with the view of employing extension on the limb for some weeks, in hopes that its malposition might thereby be corrected. A perseverance, however, in this treatment, only proved the unalterable state of the hip-joint, and confirmed my early-formed opinion. He subsequently fell under the care of my estimable friends and colleagues, Drs. HEWSON and PARRISH, in their respective tours of surgical attendance in the hospital, where we several times considered his case in consultation, and were united in our final decision, that any further attempts to release the joint would be useless.

"Finding Coyle still in the hospital, a year after his admission, much reflection on his case led me to propose to my colleagues the following operation, viz. To make an incision through the integuments, of six or seven inches in length, one half extending above and the other below the great trochanter; this to be met by a transverse section, of four or five inches in extent; the two forming a crucial incision, the four angles of which were to meet opposite to the most prominent point of the great trochanter; then to detach the fascia, and, by turning the blade of the scalpel sideways, to separate anteriorly all the muscular structure from the bone, without unnecessarily dividing their fibres. Having done this, in like manner, behind and between the two trochanters, to divide the bone transversely through the great trochanter, and part of the neck of the bone, by means of a stroug and narrow saw, made for the purpose; this being accomplished, to extend the limb and dress the wound. After the irritation from the operation shall have passed away, to prevent, if possible, by gentle and daily movement of the limb, &c. the formation of bony union; and to establish an attachment by ligament only, as in cases of ununited fractures, or artificial joints, as they are called.

"In this proposition, four material points presented themselves for consideration, viz. the practicability of the operation; the degree of risk to life, consequent thereto; the probability of being able to arrest ossific re-union; and the reasonable prospect of benefitting the patient thereby. The arguments I adduced in favour of such an operation, were these: That the anatomy of the part did not present any insurmountable obstacle to it. The fear of cutting into a joint was not to be entertained here, since, from previous disease, all the characteristics of a joint were gone; synovial membrane destroyed; cartilages absorbed; and an amalgamation of the head of the femur with the acetabulum, had taken place. That the shock to the vital system would not, probably, be greater than is frequently endured from accidental injuries, and other operations. That, if the opinion commonly assigned as the cause of the formation of false joints, after fractures, be true, such as frequent motion in the broken ends of the bone, a deficiency of tone in the system, &c. these agents could be resorted to with promising results."

"Accordingly, on the 22d day of November, 1826, assisted by Drs. HEWSON and PARRISH, I proceeded to the operation publicly in the Pennsylvania Hospital.

"To a large medical class, and many respectable physicians, assembled, I again represented the nature of the case, and of the operation, and

the views and course of reasoning which induced me to adopt it; stating likewise, that I wished to be distinctly understood, that a submission to my contemplated plans had not been urged upon my patient by any false or delusory promises; but that an explanation of his existing condition, and of the means proposed to be attempted for his relief, were fully made to him, in language adapted to his right comprehension of the matter, as well by my colleagues, as by myself; and that he had authorized me thus publicly to state, that he was prepared to assume all and the exclusive responsibility for the issue.

"With this exculpation, therefore, the operation, as already detailed, was put into effect. The integuments and fascia being divided and raised, the muscles in contact with the bone, around part of the great trochanter, were carefully detached, and a passage thereby made, just large enough to admit of the insinuation of my forefingers, before and behind the bone; the tips of which now met around the lower part of the cervix of the femur, a little above its root. The saw was readily applied, and, without any difficulty, a separation of the bone was effected. The thigh was now released, and I immediately turned out the knee, extended the leg, and placed the limbs side by side; by a comparison of which, in reference to length, the unsound member betrayed a shortening of about half an inch. This might have been caused partly by a distortion of the pelvis. Not one blood-vessel required to be secured. Union by the first intention was not attempted; the lips of the wound were only supported by adhesive plaster and slight dressings. The patient was put to bed, and Desault's splints were applied, to support the limb.

"The operation, though severe, was not of long duration, it being accomplished in the space of about seven minutes." In abridging this case, we are necessarily obliged to omit the daily report.

"January 20th, 1827. During the past month, no circumstance has occurred, as to the patient's general health, or the appearance of the wound, which deserved particular notice, except that the sore regularly diminished in size, and his strength increased. It must now be particularly noticed, that, in addition to the treatment already mentioned, after the twentieth day from the operation, the limb was cautiously moved in such directions as resembled the natural movement of the sound hip-joint; but in doing this, I was careful never to use such violence, to continue it so long at a time, or to repeat it so often as to occasion any permanent irritation. A sufficient time was always allowed for the patient to recover from the soreness of the last motions, before the limb was again disturbed. At first, it was necessary to allow an interval of several days between the movements, in order to obtain a subsidence of the soreness.

"In the course of a short time, however, the part became more insensible to pain from this disturbance, and the limb was more frequently moved. During the last three weeks, the patient was requested, at my daily visits to him, to exert his muscles in slightly flexing, extending, and rotating his thigh. This he accomplished without difficulty, and after a little practice, without pain. As an auxiliary step, he was occasionally propped upright in bed, so that his pelvis might be at an angle with his thigh.

"21st. It is just sixty days since the operation was performed. The wound having now entirely healed, and all appearances of inflammation gone, Coyle, with careful assistance, left his bed, and, aided by crutches, stood erect, both feet reaching the floor; he thinks he bore ten or twelve pounds weight on the weakened limb for a few minutes; made an attempt to advance the leg, and did so exclusively by muscular exertion; then rested on the sound side, and rotated the knee, and says, without pain. He was then placed in a wheeled-chair, and moved to the fire, where he sat, with both feet down, for about an hour; then retired to bed.

"March 22d, (the period at which the report was drawn up.) It is just four months since the operation was performed, and the lapse of time has not caused any restriction to the movements of the joint. The degree of motion, though more limited than that of a natural articulation at the hip, is, nevertheless, with slight aid of the spinal column, adequate to the various offices, and to the extent already described."

In the number for October, of the above-mentioned valuable Journal, there are some further observations on the case of Coyle, by Dr. Barton, who states that he was discharged the hospital, (cured,) on the 19th of May, and that he had recently made an examination of the hip with a view of stating its condition.

"There does not appear to have been any bony encroachment on the joint, but the ligamentous structure seems to have been so much thickened as to restrict by its inelasticity much of the motion of abduction and rotation. Adduction, flexion, and extension, appear to be unaffected; but as any imperfection in the various movements is amply supplied by the latitude of motion between the lumbar vertebræ, it requires nice discrimination, to detect in walking, any want of free motion at the artificial joint; being able to project the foot in any direction. When he sits down, and the knees are placed on a line with each other, it will be found that the joint is flexed to its utmost, and that the curvature of the lumbar vertebræ contributes then to enable him to assume this position.

"The patient declares, that he never in exercise ascribes particular weakness to this hip, but that he endures fatigue there as well as in any other part of the body, and that he can walk ten miles without inconvenience."

"In contemplating this operation, in such cases," says Dr. B. "the circumstance should not be overlooked, in relation to its beneficial results, that it is not merely the loss of motion in a joint which constitutes the evil to be corrected, but it is also the mal-position of the limb. If, therefore, the operation should be performed, and the surgeon fail to effect the establishment of a new joint, in consequence of the tendency to ossific re-union, the lesion of the bone will enable him to place the limb in that position best suited for convenience and usefulness, before consolidation shall again take place. The patient, thus, in either event, will be compensated for his suffering—in the one instance, by the service of a joint, or in the other, by a removal of that distortion, which, in the lower extremity, would compel him to use crutches, or, in the upper, deprive him of many of the offices it would be capable of performing, in a more favourable position of the limb."

We shall conclude our history of this important case, which reflects so much credit upon Dr. B., by submitting his concluding observations, wherein he suggests the application of the same principles which led to this operation, to other parts of the body.

"Having now established the fact, that an artificial joint can be substituted for the loss of the natural articulation at the hip, it becomes a matter of importance to ascertain how far the same principles are applicable to the formation of new joints in other parts of the body, where natural motion has been lost. My reflections on this point, have not presented any forbidding circumstances; but it is not in every joint, that the loss of motion would be sufficiently important to call for the aid of a painful operation. The most serious evil is sustained by the loss of the hip, knee, shoulder, elbow, great toe, and finger joints, and of the lower jaw; and these, I believe, may all come within the reach of amendment by an operation, if the muscles which move these respective joints are in a sound and efficient state. If they have been lost, it would be palpably wrong to form a joint, since its unrestrained motion would be more troublesome than a rigid limb.



A transverse section of the bones would be proper, if the operation were to be attempted at the shoulder, knee, fingers, or toes; but an angular division would be necessary at the elbow, in order to preserve some resemblance to the natural joint at this part.

"I hope I will not be understood as entertaining the belief, that this treatment will be applicable to, and judicious in, every case of ankylosis. I believe the operation would be justifiable *only* under the following circumstances, viz. Where the patient's general health is good, and his constitution is sufficiently strong; where the rigidity is not confined to the soft parts, but is actually occasioned by a consolidation of the joint; where all the muscles and tendons, that were essential to the ordinary movements of the former joint, are sound, and not incorporated by firm adhesions with the adjacent structure; where the disease, causing the deformity, has entirely subsided; where the operation can be performed through the original point of motion, or so near to it, that the use of most of the tendons and muscles will not be lost; and, finally, where the deformity, or inconvenience, is such, as will induce the patient to endure the pain, and incur the risk of an operation."

#### EXSECTION OF THE CLAVICLE BY DR. MOTT.

An incision was commenced over the articulation of the clavicle with the sternum, and carried in a semicircular direction as close to the fungous projection as the sound integuments would warrant, until it terminated on the top of the shoulder, near the junction of the clavicle with the acromion scapulæ.

This incision exposed the fibres of the pectoralis major muscle, which was divided as near the tumour as possible. In accomplishing this, as well as in the first incision, arteries sprung in every direction, and required ligatures. A number of large branches of veins under this muscle emitted a free flow of blood, and required to be tied.

In conducting the incision through the pectoral muscle towards the scapular extremity of the clavicle, care was taken to avoid the cephalic vein, as it passes between this muscle and the deltoid. A small portion of the latter muscle being detached from the clavicle, readily permitted the vein to be drawn outward towards the top of the shoulder.

On attempting now to insinuate the point of the forefinger under the vein and deltoid to the lower edge of the clavicle, it was found impracticable, as the hard osseous part of the disease extended completely beyond this point, and was in contact with the coracoid process of the scapula.

Finding it impossible from the size of the tumour and its proximity to the coracoid process, to get under the clavicle, in this direction, an incision was made from the outer edge of the external jugular, over the tumour, to the top of the shoulder. After dividing the integuments, platysma myoides, and a portion of the trapezius muscle, a sound part of the clavicle was denuded, at a point nearer the acromion, than a line with the coracoid process.

A steel director, sufficiently curved, was now cautiously passed under the bone from above, which, from the firm bony state of the tumour at this part, had a considerable obliquity outwards. Great care was taken to retain the instrument in contact with the under surface of the bone.

From the depth of this bone from the surface, it was attended with some difficulty to accomplish it safely. An eyed probe similarly curved, conveyed along the groove of the director, a chain saw, which when moved a little, showed that nothing intervened between it and the bone. The clavicle was then readily sawed through.

The dissection was now continued along the under surface of the tu-



mour, below the pectoralis major, in which a number of large arteries and veins were tied. The first rib being next exposed under the sternal extremity of the clavicle, the costo-clavicular, or rhomboid ligament, was divided, and the joint opened from the lower part. This gave considerable mobility to the diseased mass, and encouraged us to believe that the complete removal of it would be practicable.

By means of a double hook and elevator, and the assistance of our strong and very broad spatulas properly bent, we were enabled to raise a little the sawed end of the clavicle. After separating the parts about it, by keeping close to the tumour, we wished to discover the subclavius muscle, as it is inserted in the bone about this situation, but it could not be seen, as it was incorporated with the diseased mass. Had this muscle been found, the separation of the tumour would have been much less difficult and tedious, as by keeping above the muscle, the subclavian vein of course is protected. The origin of this muscle from the first rib, was seen and divided, but it was almost immediately obliterated in the tumour.

Pursuing the removal of the tumour, at the upper and outer part, the omo-hyoideus muscle was found lying under it, which we exposed from where it passes under the mastoid, to near its insertion into the superior costa of the scapula. In separating the tumour from the cellular and adipose structure between the omo-hyoid and the subclavian vessels, a number of large arteries were divided, which bled freely, particularly a large branch from the inferior thyroïdal.

The anterior part of the upper incision was now made from the sternal end of the clavicle, and carried over the tumour until it met the other at the external jugular. After dissecting through the platysma myoides, this vein was carefully separated from the surrounding parts, and two fine ligatures passed underneath it, and tied a short distance from each other. The vein was then cut through between them.

The clavicular part of the mastoid was next divided, about three inches above the clavicle, in the direction of this incision. The deep seated fascia of the neck being now exposed, the mastoid muscle and the diseased mass were very cautiously separated from it, until the anterior scalenus muscle was exposed.

The subclavian vein, from the coracoid process to the edge of the scalenus anticus, was so firmly adherent to the tumour, as to lead me at one moment to believe that the coats of the vein were so intimately involved in the diseased structure, as to render the complete removal of the morbid part utterly impracticable. By the most cautious proceeding, however, alternately with the handle and edge of the scalpel, we finally succeeded in detaching the tumour without the least injury to the vein. This part of the operation was attended with peculiar danger and difficulty. At every cut, either an artery or vein would spring and obscure the parts, and require to be secured. Besides several large veins, the external jugular was so situated in the midst of the bony mass, as to require two other ligatures in this situation, close to the subclavian; and it was again divided in the interspace. Near the sternal end of the clavicle, a large artery and vein required ligatures; they were considered branches of the inferior thyroïdal artery and vein.

From having cut through the clavicular part of the sterno-mastoid obliquely upwards and outwards a little above the tumour, we were enabled by turning this down, and keeping close to the fascia profunda, to detach the tumour from over the situation of the thoracic duct, and junction of the internal jugular and subclavian veins, without the least injury to these important parts. To reach the lower part of the tumour, as it extended upon the thorax, it was necessary to separate the pectoralis major muscle on a

line with the fourth rib, and to make a transverse incision, two inches in length, through the integuments and muscle, at about its centre.

The incision upon the neck extended from the sterno-clavicular junction, in a semicircular direction, to within an inch of the thyroid cartilage and base of the lower jaw, and two inches of the lobe of the ear, and terminated near the junction of the clavicle and scapula.

The fungous and bleeding character of the upper and most projecting part of the tumour, indicated that it was freely supplied with vessels. The discharge of blood was so free, at every step of the operation, that about forty ligatures were applied. It was estimated that the quantity of blood lost, was from sixteen to twenty ounces.

All the parts now presenting a healthy appearance, the ligatures were cut close, and the cavity of the wound filled with lint. Long strips of adhesive plaster were applied, to prevent the edges of this extensive wound from further retracting. A light compress and single-headed roller, rather loosely applied round the chest and shoulders, completed the dressing. He was placed in bed, upon his back, inclining a little to the right side, with his head considerably elevated. The left shoulder and arm were supported upon pillows.

It is not necessary, in this place, to enter into the progressive details of this highly interesting case, which reflects so much credit upon the distinguished surgeon, and is so highly honourable to the surgery of our country. Three months after the operation was performed, the wound had healed, and the patient was completely well. An ingenious apparatus has been contrived by Professor M., to supply the loss of the clavicle.

### EXTIRPATION OF THE PAROTID GLAND.

“Surgeons were for a long time in the habit of removing tumours of various sizes from the parotidian region; but it was not until 1823, when Professor Beclard performed his operation, that they had agreed upon the possibility of removing the whole parotid gland. It may not be improper therefore to give an account of the principal circumstances of the operation, notwithstanding its want of success, in order to enable the reader to form some idea how to proceed in similar cases.

“After having made two semicircular incisions around the tumour, Beclard dissected out the portion of the gland which is situated in front of the masseter muscle, and endeavoured to detach it from before backwards, but experienced great difficulty at the internal pterygoid muscle. In order to avoid a hemorrhage, which it would not have been easy to arrest during the operation, he determined to make an incision through the thickest part of the tumour, and by dissecting it from above downwards, he raised the mass, and with it, the inferior half of the cartilage of the meatus auditorius externus, which participated in the disorganization. After having tied a number of arteries, he proceeded to the extirpation of the rest of the tumour. He had nearly finished the dissection, which was performed with the greatest precaution, of the portion of the gland which dips behind the ramus of the lower jaw, when a large jet of blood indicated the division of the external carotid or one of its principal branches. Beclard immediately applied the index finger of the left hand upon the point where the blood issued, and applied two ligatures, the one above, and the other below the point where the carotid appeared to have been opened. The artery was then brought forwards, and slight pressure applied to it until the rest of the tumour was dissected. A small portion of the gland was left near the cervical vertebræ, on account of the narrowness of the wound at that part of the incision, and of the difficulty of entering it. This portion of the tumour was tied with a ligature. The masseter muscle was com-

pletely uncovered, and the branches of the seventh pair of nerves were entirely removed with the tumour. The labial artery was denuded, but not divided. At the posterior part of the wound could be seen the mastoid process of the temporal bone and the sterno-cleido-mastoideus muscle; at its internal part, the styloid process, and the external carotid with its two ligatures; lower down were the stylo-hyoid and the digastric muscles; the small portion of the tumour which had been tied, formed the bottom of the wound, which opened into the meatus auditorius externus."—*Extr. from the Arch. Gen. de Méd.*

'In the spring of 1826, Dr. M'Clellan, professor of Surgery in Jefferson College, successfully extirpated the whole parotid gland, affected with scirrhus enlargement. The patient was an intelligent young surgeon from Europe, and the swelling was so enormous that the whole left side of the face was considerably distorted. On examining the parts, it was found that there was a large and irregular cicatrix over the most prominent surface of the tumour, which proceeded from an ineffectual attempt, previously made by an eminent surgeon of Dublin, to extirpate the diseased gland. As the patient was incessantly harassed with the most excruciating pain, and suffered constantly from a very troublesome chronic inflammation of the left eye, in consequence of an inability to close the eyelids, Dr. M'Clellan was at length prevailed upon to make an attempt to extract the tumour, and thus afford the unhappy sufferer the only chance of relief.

'The operation was commenced by making two curvilinear incisions, extending from a short distance above the zygoma to within about two inches and a half below the angle of the lower jaw. The integuments were then raised from the surface of the tumour, and an incision was made down upon the zygoma and masseter muscle before, and upon the cartilaginous tube of the ear and mastoid process behind. Being unable to dissect farther in either of these directions, Dr. M'Clellan immediately proceeded to burrow under the lower extremity of the mass. In endeavouring to accomplish this part of the operation, he was necessarily obliged to divide the posterior belly of the digastric muscle; after which the fingers were at once admitted under the whole body of the tumour, so as to enable him to make effectual attempts to wrench it from its bed. Before he proceeded farther, however, he insulated the continued trunk of the external carotid, just as it was entering the tumour, together with the descending veins, which accompanied it; and, instead of cutting them across, in the usual manner, he tore them out from the body of the tumour with the thumb and forefinger. The operator's face and eyes were instantaneously deluged with a gush of blood; but before he could recover himself sufficiently to cast a ligature around the vessels, which he still commanded with his fingers, the hemorrhage had completely ceased. After powerful and repeated efforts at wrenching, aided by an occasional use of the knife, to divide the strong bands of cellular substance, and some of the fibres of the styloid muscle, which adhered to the tumour, he finally succeeded in elevating the whole mass above the mastoid process and ramus of the lower jaw. The trunk of the portio dura, very much enlarged in consequence of the previous irritation, was then seen emerging from under the mastoid process, and mounting over the posterior margin of the tumour, to enter its substance near the anterior surface. The unnatural state of tension in which this nerve was then placed, produced such an agonizing degree of pain, that the patient was thrown into convulsions and syncope. These, however, speedily disappeared on dividing the nerve; in doing which, the cells of the conjunctiva were instantaneously injected with extravasated blood. The operation was then completed by separating the upper portion of the tumour from the zygoma, which was effected by the scalpel, inasmuch as the layers of fascia were too strong to be lace-



rated. In this last step of the operation, Dr. M'Clellan was necessarily compelled to cut the main trunk of the temporal artery; and this was immediately secured with a ligature, the only one employed during the whole operation.

'On examining the cavity of the wound, it appeared much larger at the bottom than on the surface; and its depth was at least four inches and a half from the skin to the walls of the pharynx, which was largely exposed at the bottom of the wound. The styloid process, entirely denuded, and even divested of a large proportion of its muscular fibres, which had been torn away with the tumour, projected into the postero-inferior part of the wound. The internal carotid and jugular vein, together with the hypoglossal nerve, which were barely covered with some loose cellular tissue, formed the posterior parietes of the deep and expanded part of the cavity that was situated within the ramus of the jaw before, and the mastoid process behind. With a finger, introduced behind the ramus and angle of the jaw, could be felt the two pterygoidei muscles, which were completely exposed, and projected into the cavity in that situation. In fact, the tumour appeared to have projected into, and to have filled up every space into which the parotid itself could possibly have insinuated; and no vestige of any portion of that gland, either sound or morbid, could be discovered in any part of the exposed cavity.

'My limits will not allow me to enter into all the details of this interesting case: suffice it to mention, that the lips of the wound were brought together with the interrupted suture and a few strips of adhesive plaster; and that the patient, although his sufferings were extremely great, finally completely recovered.'—*See the American Medical Review*, vol. iii. p. 387.

"To deny that the parotid gland has never been extirpated, would be to impeach the veracity of some of the most skilful anatomists and surgeons that adorn the present age. That the operation is dangerous, and difficult of execution, no one will presume to dispute; but to assert that it can not be performed, is not only absurd, but altogether incompatible with the present state of surgery. Can it be supposed that such men as Beclard and Sir Astley Cooper, whose names are known in every part of the world where medicine is cultivated as a science, would be guilty of publishing cases which never had any existence? Whatever may be the opinion of American and European surgeons upon this subject, I have no hesitation in stating it as my belief, that those who will candidly examine the cases which are on record, will be convinced that the operation is not only practicable, but that it has been actually performed."—*Tavernier's Operative Surgery*, by S. D. Gross, M. D. pp. 231-233.

In the second case operated on by Dr. M'Clellan for a tumour of five years standing, "he proceeded to the removal of the tumour, first by making a curvilinear incision on each side of it, commencing just above the zygoma, and extending down the neck until they met about two inches below the angle of the jaw. These were deepened until the masseter muscle and angle of the jaw were exposed in front, and the mastoid process and muscle behind the tumour. As the chief mass of the tumour appeared to extend below and behind the face, where it was firmly wedged down, beyond the reach of all further dissection in that direction, the operator changed his mode of proceeding, and began to extend the incisions about two inches further down the neck. This brought into view an oblong process of the tumour, about two inches in length, and three-fourths of an inch in diameter, which extended down from the main body of the gland, and was lodged in the common sheath of the great vessels. On raising this process of the tumour from below, the common carotid artery and jugular vein were fairly exposed, opposite the side of the thyroid cartilage. As the whole surface bled profusely, we concluded that it would



be necessary to take up the carotid artery. It was accordingly secured at once with a single ligature; immediately after which the hemorrhage subsided, and the exposed surface became perfectly dry.

"Dr. M'C. then proceeded to burrow under the body of the tumour, using the handle and occasionally the blade of his scalpel. The back part of the tumour was then found to be attached to the transverse processes of the two upper cervical vertebræ, and to have become imbedded in, or incorporated with, the posterior belly of the digastric, and the upper portions of the sterno-mastoid and trachelo-mastoid muscles. These muscles were therefore cut away, in part, and the bones denuded; after which, the tumour was dissected upwards from underneath the ramus of the jaw and mastoid process: the styloid process being laid bare, and also the slender muscles which originate from it. In this part of the operation, the trunk of the *portio dura* was brought up from under the mastoid process, and of course divided along with the tumour. Several branches of the external carotid were also divided, two of which bled from the recurrent circulation, and had therefore to be secured; viz., the occipital and facial arteries.

"The mass which had thus been elevated, was evidently a morbid enlargement of the parotid gland, partially enveloped in a thin capsule, and composed of a black medullary substance, interspersed among the healthy looking granules of the parotid. The back, or under part, of this mass, had no capsule, and the deepest part of the exposed cavity, which corresponded with this, was occupied by a healthy looking portion of the gland, in which a large branch of the nerve was seen ramifying. We agreed that it would be improper to leave this remnant of the gland behind. Dr. M'C., therefore, dissected it out completely, and brought it up over the zygoma, along with the morbid part which he had before raised above the jaw. This last step was followed by an alarming gush of arterial blood, which most probably proceeded from the internal maxillary artery, but was speedily arrested by the tenaculum and ligature.

"The whole mass, in one partly divided body, was finally dissected away from the zygoma, to which it was firmly tied by a tendinous fascia, during the division of which, the patient complained of more pain than in all the other stages of the operation. It appeared to me to be a remarkable circumstance that he evinced no pain when the *portio dura* was dissected up, although since Dr. M'Clellan has explained Mr. Charles Bell's new doctrine of the nerves, to me, the cause is obvious. The total paralysis of the muscles on that side of the face and head,\* which was immediately discoverable after the tumour had been thus removed, also astonished me not a little, although I now perfectly understand the rationale of that circumstance.

"On examining the cavity of the wound, the cartilaginous tube of the ear was found to be exposed down to the auditory process of the temporal bone, and the ligament which ties it to that process was partly divided, so as to give egress to a quantity of blood through the external ear. The articulation of the jaw was partly exposed, so that the interarticular cartilage could be seen behind and above the condyle, on every motion of the joint. The depth of the wound was very great, full two inches and a half from the angle of the jaw towards the posterior fauces, and top of the pharynx. Not a single granule or particle of the gland was left behind. Of this fact we formed a satisfactory opinion, inasmuch as the whole of the exposed surface was left clear and dry, after the cessation of the hemorrhage, and could be thoroughly examined by the eye, as well as by the touch.

\* The auricular muscles, the right half of the occipito-frontalis, the corrugator supercilii, the orbicularis palpebrarum, and all the muscles of the nose, cheeks, and lips, of the right side, were totally paralyzed. The levator palpebræ superioris, the muscles of the eyeball, and the muscles of mastication, remained uninjured.

"After having dissected away several diseased lymphatic glands, in the form of small black tubercles, from behind the *sterno-mastoideus*, we dressed the wound with dry lint and adhesive straps, over which was applied a compress and head bandage. The patient was then carried to his bed, having borne the operation with amazing fortitude, and in a sitting posture.

"I remained five days and nights with my brother, after the operation, during which time I found occasion to administer no other medicine than a simple effervescing mixture, and a few doses of antimonial solution. The bowels were kept open by injections, and the febrile heat was reduced, when the symptomatic fever came on, by ablutions with cold water. No other unfavourable symptoms occurred than a great difficulty of deglutition, and violent pains in the head, which I succeeded in mitigating by the steady application of ice and ice water. In the course of a few weeks after I had returned to Pottsville, I had the pleasure of hearing that our patient had perfectly recovered from the operation, and was actively engaged about his usual business, in his coach manufactory.

"It is now eight months since the operation. He is in the enjoyment of perfect health, experiencing no other inconvenience, than such as must necessarily result from a deep sunken scar, behind the jaw, which impedes deglutition to some extent, and a total muscular paralysis of the same side of the countenance, which has been produced by the loss of the *portio dura* nerve. He cannot close the eyelids of that side, nor can he laugh without producing excessive distortion towards the opposite side; but his sensibilities are all perfect, both in the eye and over the countenance.

"The entire parotid gland has therefore been successfully extirpated, for the second time, on this side of the Atlantic. This operation affords another instance of the skill and intrepidity of American surgeons, and may be placed on a parallel with any that have been recorded in the annals of surgery.

"Should any medical gentleman desire to see the patient, I would most respectfully invite them to call on my brother, Mr. Charles Sorber, opposite the falls of the Schuylkill, on the Ridge turnpike, four miles from the city of Philadelphia. The tumour has been deposited in the museum of Jefferson College, where it can be examined at any time by those who may desire to receive further satisfaction than I have been able to afford in this detail."—See Case reported by Dr. J. E. Sorber, in the *New York Medical and Physical Journal*, No. XXXII. pp. 310-313.

THE END.





NATIONAL LIBRARY OF MEDICINE



NLM 04139470 1